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RÉSULTATS DES EXPLORATIONS
ZOOLOGIQUES, BOTANIQUES, OCÉANOGRAPHIQUES ET GÉOLOGIQUES
ENTREPRISES AUX
INDES NÉERLANDAISES ORIENTALES en 1899—1900,
à bord du SIBOGA
SOUS LE COMMANDEMENT DE
G. F. TYDEMAN
PUBLIÉS PAR
MAX WEBER
Chef de l'expédition.

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*III. Résultats hydrographiques, G. F. Tydeman.
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Siboga-Expeditie

THE
GORGONACEA OF THE SIBOGA EXPEDITION
IV. THE PLEXAURIDÆ

BY

C. C. NUTTING
Professor of Zoology, State University of Iowa

With 4 plates

Monographie XIIIb^1 of:

UITKOMSTEN OP ZOOLOGISCH,
BOTANISCH, OCEANOGRAPHISCH EN GEOLOGISCH GEBIED
verzameld in Nederlandsch Oost-Indië 1899—1900
aan boord H. M. Siboga onder commando van
Luitenant ter zee 1^e kl. G. F. TYDEMAN

UITGEGEVEN DOOR

Dr. MAX WEBER
Prof. in Amsterdam, Leider der Expeditie

(met medewerking van de Maatschappij ter bevordering van het Natuurkundig
Onderzoek der Nederlandsche Koloniën)

BOEKHANDEL EN DRUKKERIJ
VOORHEEN
E. J. BRILL
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Het Ministerie van Koloniën.

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THE GORGONACEA OF THE SIBOGA EXPEDITION

IV. THE PLEXAURIDÆ

Siboga-Expeditie
XIII b[1]

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Family PLEXAURIDÆ Gray.

Plexaura Lamouroux. Exposition Méthodique, 1821, p. 35.
Plexauridæ Gray. Annals and Magazine of Natural History, Series 3, Vol. IV, 1859.
Eunicea + *Plexaura* Milne Edwards et Haime. Histoire naturelle des Coralliaires, 1857, Vol. I, pp. 146, 152.
Euniceidæ Kölliker. Icones Histologicæ, II, 1865, p. 137.
Plexauridæ Verrill. Transactions Connecticut Academy of Science, Vol. I, 1869, p. 135.
Euniceidæ Ridley. Annals and Magazine of Natural History, Series 5, Vol. 11, 1883, p. 253.
Plexauridæ Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 135.
Plexauridæ Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 111.
Plexauridæ Brundin. Bihang til Svenska Vet.-Akad. Handlingar, Band 22, Afd., 17, N⁰ 3, 1896, p. 17.
Plexauridæ Thomson and Henderson. Ceylon Pearl Oyster Report, Alcyonaria, 1905, p. 304.

The original definition of the family, as given by GRAY, is as follows:

"Bark granular, persistent, cork-like, without any important grooves. Cells placed equally on all sides of the branches".

234629

Verrill, as usual, was quick to discern the most important characters by which this family can be differentiated from its allies. His definition is as follows:

"Corallum usually dichotomous or more or less arborescent. Axis horn-like, or more or less calcareous, especially at base. Longitudinal ducts equal, arranged regularly all around the axis. Cœnenchyma usually thick. Cells scattered over all parts of the surface, flat, or elevated on prominent verrucæ. Tentacles at base, and sides of the polyps stiffened with large fusiform spicula. Spicula of the cœnenchyma usually large, of various forms, most usually these are large warty spindles mingled with clubs or crosses".

For the purposes of this work the following definition is offered:

Cœnenchyma thick, without evident grooves; axis cylinder horny, or horny and calcareous, but never jointed. Primary water-vascular canals in a regular series around the axis. Calyces on all sides of the stem and branches, often entirely included. Spicules various, usually spindles, clubs, butterfly-shaped or Blattkeulen.

As Wright and Studer remark: "The genera belonging to the family as it now stands, certainly require revision".

The material secured by the Siboga Expedition that can be referred to the Plexauridæ is not sufficient in extent to justify the author of this report in undertaking a revision of the family, and he therefore contents himself with recognizing the genera defined in the Challenger Report, and the addition of a single new genus which seems necessary to accommodate a remarkable species collected by the Siboga Expedition.

The most important feature in the diagnosis of genera in this family seems to be the character of the axis cylinder, the forms of the calyces and spicules being however, of great service in generic description in some cases.

The following artificial key may be of service in aiding the student to determine the generic affinities of species.

Artificial key to the genera of PLEXAURIDÆ.

Stem, branches and horny axis distinctly flattened . . . . (Platygorgia)[1]
Calyces prominent and bilabiate . . . . (Eunicea)
Calyces moderately prominent, not bilabiate.
  Spicules armed with long, truncate verrucæ . . . . (Anthoplexaura)
  Spicules small, the outer layer club-shaped. . . . . (Paraplexaura)
Calyces neither bilabiate nor decidedly prominent. Axis not distinctly flattened.
  Axis entirely horny, except at base, or with calcareous particles deposited in the central core.
    Spicules usually spindles, horizontally or longitudinally placed in outer layer of cœnenchyma.
    Cœnenchyma thick. No very large, bar-like spicules . , ... Plexaura

---

[1] Generic names enclosed in brackets indicate that such genera are not represented in the Siboga collection.

Cœnenchyma thin. Large, bar-like spicules very prominent. . . . **Hicksonella**
Spicules of outer layer clubs or "Blattkeulen" vertically placed.
  Clubs large. Terminal branches long and slender . . . . . . **Plexauroides**
  Clubs small. Terminal branches short . . . . **(Paraplexaura)**
  Clubs minute, their club-ends inflated and free . . . . **(Eunicella)**
Axis with a central horny core, around which is a tubular casing containing more or less calcareous matter.
Spicules large, clubs, crosses and triradiate forms predominating. . . **(Plexaurella)**
Spicules small, short oval spindles and double spindles predominating. **Euplexaura**

The writer is unable to find any character in the definition of the genus *Psammogorgia* Verrill by which it can be differentiated from others of the family. He therefore gives the definition proposed by the original describer, which is as follows:

"*Psammogorgia* Verrill. Corallum dichotomous or subpinnate, with ronnd branches. Axis horn-like. Cœnenchyma moderately thick, the surface finely granulated with small rough spicula. Cells scattered, sometimes flat, more frequently raised in the form of rounded verrucæ. Polyps with rather large, elongated, slender warty spindles at the bases of the tentacles. Spicula of the cœnenchyma mostly short, thick, and very rough, warty spindles and rough, warty clubs of moderate size".

(VERRILL, Transactions Connecticut Academy of Science, Vol. 1, Part 2, p. 414).

Synoptic view of the genera and species of the Siboga collection of PLEXAURIDÆ.

*The asterisk (*) denotes a new genus or species.

Plexaura.

**P. aggregata*, **P. attenuata*, **P. recta*, **P. platystoma*, **P. pinnata*, **P. flava*.

Plexauroides.

P. praelonga, *P. lenzii*.

Euplexaura.

**E. rubra*, **E. mollis*, **E. reticulata*.

*Hicksonella.

**H. princeps*.

Psammogorgia.

P. arbuscula.

The above table indicates that of the thirteen species of the Plexauridæ collected, ten appear to be new, and nearly half of the total number belong to the type genus, *Plexaura*. This genus has heretofore been unrepresented in the East Indian Region, with the exception of one species which THOMSON and HENDERSON identify as a variety, (*flexuosa*) of *P. antipathes*. The present writer is of the opinion that this form is identical with the new species *P. aggregata*, described beyond.

Systematic discussion of genera and species.

Plexaura Lamouroux (emended).

Plexaura Lamouroux. Histoire des Polypiers coralligènes flexibles, 1816, p. 424.
Plexaura Lamouroux. Exposition Méthodique, 1821, p. 35.
Plexaura Milne Edwards et Haime. Histoire Naturelle des Coralliaires, Vol. 1, 1857, p. 152.

Plexaura Duchassaing et Michelotti. Coralliaires des Antilles, 1860, p. 25.
Plexaura Kölliker. Icones Histologicæ, II, 1865, p. 138.
Plexaura Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 137.
Plexaura Thomson and Henderson. Pearl Oyster Fisheries Reports, the Alcyonaria, 1905, p. 304.

The original describer, LAMOUROUX, gave a definition for this genus that needs little change to fit it for modern use. It is as follows:

"Polypier dendroïde, rameux, souvent dichotome; ramaux cylindriques et roides; axe légèrement comprimé; écorce, dans l'état de dessication, subéreuse, ou terreuse, très-épaisse, faisant peu d'effervescence avec les acides, et couverte de cellules éparses, grandes, nombreuses, souvent inégales et qui ne sont jamais saillantes".

Eliminating non essential points, the difinition used for the present work will be as follows:

Cœnenchyma thick, calyces included and distributed on all sides of the stem and branches. Spicules in the form of warty spindles and clubs, usually in two layers. Axis entirely horny, except at the base of the stem of large specimens.

The character of the axis will differentiate this genus from **Plexaurella**, which greatly resembles it superficially, and from **Euplexaura** and **Pseudoplexaura**. The characters of the spicules will separate it from **Plexauroides** and **Hicksonella**.

The type of this genus is *Plexaura heteropora* (Lamarck).

Owing to the superficial resemblance between **Plexaura** and **Plexaurella**, both genera abundant in species, it is impracticable, without recourse to the types, to tell which of the species originally described should be placed in **Plexaura**. Both of these genera are but sparsely represented in previous collections from the Western Pacific, or Indo-Pacific region. Hence it is not surprising that the species in the Siboga collection are all apparently new.

1. *Plexaura aggregata* new species. (Plate I, figs. 1, 1*a*; Plate IV, fig. 1).

Stat. 58. Anchorage off Seba, Savu Island. Up to 27 meters.
Stat. 65^a. 7° 0' S., 120° 34'.5 E. Flores Sea. Depth changing rapidly from 400—120 meters. Coral bottom.
Stat. 213. Saleyer anchorage, and surroundings. Up to 36 meters.
Stat. 258. Tual anchorage, Kei Islands. Reef. 22 meters.
Stat. 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters.

Colony consisting of a dense clump of branches, 36 cm. in height. The branches all spring from the base of the colony and almost immediately begin to subdivide. The base is about 4.5 cm. broad, and the largest branches have a diameter of about 2 cm. The branches divide irregularly, but ordinarily the division is not dichotomous, until ultimate branchings of the 9th or 10th order are attained, the result being hundreds of terminal twigs with a diameter of about 3 mm. All of the branches are round and smooth, and distinctly enlarged at their ends. The calyces are inserted on all sides of the branches, and are evenly spaced, averaging about 1 mm. apart. The cœnenchyma is very thick.

The individual calyces are completely inserted, leaving the surface of the branch perfectly even, except where pitted by the calyx apertures. These pits are quite small, in alcoholic specimens, the pits being oval instead of round, their greater diameter being parallel to the long axis of the branch and seldom attaining a length of over 1 mm. The margin appears to be divided into shallow lobes lying horizontally. The polyps are small, with delicate fringed tentacles, their bodies bearing eight longitudinal bands of very slender spindles. The tentacles appear to be unarmed.

A cross section of a branch shows a horny axis surrounded by very large watervascular canals symmetrically arranged on all sides of the axis, their cavities being larger than those of the calyces.

Spicules. These are all very small and the prevalent type is a very deeply tuberculate spindle with the tubercles arranged in definite series or zones. Clubs are also common. There are no well-defined layers of spicules in the cœnenchyma.

Color. The colony is very light brown, in alcohol. The axis is almost black proximally, and lightens distally. It has a slender, white core, which is not calcareous.

This species is probably identical with *Plexaura antipathes* var. *flexuosa* Thomson and Henderson. Ceylon Pearl Oyster Fisheries Report, the Alcyonaria, 1895, p. 305.

It seems a very distinct species, however, differing from *Plexaura antipathes* in having no violet spicules.

A specimen from Stat. 258 is much larger than the one described, being 90 cm. in height, with a main stem 2 cm. in diameter. At the base there is a solid, flinty, calcareous layer surrounding a horny core 7 mm. in diameter. The axis of the branches is entirely horny.

2. *Plexaura attenuata* new species. (Plate I, figs. 2, 2*a*; Plate IV, fig. 2).

Stat. 162. Between Loslos and Broken Islands, West coast of Salawatti. 18 meters.
Stat. 164. 1°42'.5 S., 130°47'.5 E. Near New Guinea. 32 meters.
Stat. 285. 8°39'.1 S., 127° 4'.4 E. Timor Sea. 34 meters.
"Bay of Batavia. Professor SLUITER leg.".

Specimen (incomplete) consisting of a straight, wand-like stem about 37 cm. long, from which project three short, straight branches all of which have their distal ends broken off. The greatest diameter of the main stem is 3 mm., tapering to 2 mm. near its distal end. The calyces are evenly distributed on all sides of the colony, but are larger and further apart than in *Plexaura aggregata*. Nearly all of the polyps are partly extended, and this gives the calyces the appearance of being partly exserted and verruciform. In fact, however, the calyces are hardly raised above the general level of the cœnenchyma when the polyps are retracted, although there may even then be a slight swelling.

The individual calyces are about 1.7 mm. in diameter, and when the polyp is retracted the calicular margin shows eight very plain scallops or lobes which are larger and deeper than in the preceding species. The polyps are able to protrude their bodies considerable above the calyces and still keep the tentacles folded within the body walls, where they form an acorn-shaped mass, the individual tentacles being plainly seen within the transparent body wall. The lower part of the polyp shows very delicate longitudinal bands of spicules.

A cross section of the stem shows a thick cœnenchyma in which the calyces are sunken almost to the axis cylinder. The canals are not nearly so regular and distinct as in *Plexaura aggregata*. The axis is horny, with a white noncalcareous centre.

Spicules. The spicules are all small, terete spindles with regularly disposed annular rows of compound verrucæ, giving a very symmetrical pattern. Definite layers of spicules can not be made out, as they seem to pack the cœnenchyma from the surface nearly to the axis. The spicules are those which KENT figures as characteristic of the genus *Verrucella* in the Monthly Microscopical Journal, Feb. 1st, 1870, Plate XLII, fig. 3.

Color. The specimen is a light brown or tan color. The axis is dark brown and the spicules are colorless.

3. *Plexaura recta* new species. (Plate II, figs. 3, 3*a*; Plate IV, fig. 3).

Stat. 273. Anchorage off Pulu Jedan, E. coast of Aru Islands (Pearl Banks). 13 meters.
Stat. 299. Buka or Cyrus Bay, South coast of Rotti Island. 34 meters.
*Pulu Missa near Flores. J. H. DE SISO don. 3 specimens.

Colony flabellate in form, not reticulate, attaining a height of 59 cm. About 2 cm. above the base the main stem divides into two, and each of these divides often, but not usually, in a dichotomous manner until twigs of the 7th order of division are attained. The ultimate branches are long and slender, erect and parallel. They sometimes attain a length of 39 cm., are round, and of approximately of the same diameter throughout. The main stem is 1 cm. in diameter at its base, and the ultimate branches are from 2 to 3.5 mm. in diameter. The calyces are evenly distributed on all sides and are entirely included when the polyps are retracted, leaving but a slightly elevated border around the apertures. The apertures, in dried specimens, form sharp oval openings.

The individual calyces are small and sunken almost to the axis. The margin is surrounded by well-marked scallops as in the preceding species. The tentacles in the specimen described often protrude through these apertures, although the polyps themselves are entirely retracted. The tentacles are very long, with long delicate fringes. I am unable to find any spicules in the body walls or tentacles.

A cross section of a branch reveals a condition much as in the last species. The axis is noncalcareous, with a white centre around which are a number of light-colored strands, none of which are calcareous. The canals are proportionally small and inconspicuous, and their arrangement can not easily be determined.

Spicules. These are very short, stout, small densely tuberculate spindles, often so short as to be almost globular. The tubercles are so closely crowded as to cover the whole surface almost like the round cells of a morula. There is no division of spicules into definite layers.

Color. The colony is dark brown, in alcohol. Axis black, lightening distally. A specimen from Stat. 273 is 64 cm. in height, and more profusely branched than the type described.

4. *Plexaura platystoma* new species. (Plate II, figs. 2, 2*a*; Plate IV, fig. 4).

Stat. 43. Anchorage off Pulu Sarassa, Postillon Islands. Up to 36 meters.

Colony of irregular and straggling habit, 16 cm. in height. The main stem gives off four branches of very unequal size, one of which arises about 5 cm. from the base. This becomes the main part of the colony, bearing several short stubby branches very unequally distributed, and one large descending branch producing a number of slender undivided branchlets in an indistinctly pinnate manner. The diameter of the main stem and largest branch is 1.8 mm. The calyces are entirely included and rather sparsely distributed on all sides of the stem and branches. The polyps in retraction draw the calyx margins together so that the apertures are almost obliterated. In the dried fragment of a branch, however, the apertures are really much larger than in either of the preceding species.

The individual calyces, although hardly evident externally, are really considerably broader than in the other species described. The apertures are oval, the long diameter being parallel with the axis. The longer diameter of the calyx is about 1.5 mm. The polyps have eight longitudinal bands of slender spindles, and the tentacles have a number of delicate spindles on their dorsal surface. These latter are arranged in two longitudinal series on each tentacle, so as to approach the en chevron arrangement on the proximal portions. The layers of the cœnenchyma are not well defined.

A cross section of a branch shows a moderately thick cœnenchyma, well-defined but not numerous watervascular canals, and a horny axis with a white, noncalcareous core.

Spicules. These are rather slender, usually curved spindles of the same general type as in *Plexaura attenuata*, but larger than any others thus far described in this report, some of them attaining a length of 1 mm. The annular arrangement of the tubercles is not so well-marked as in *P. attenuata*.

Color. Very pale gray, almost white, in alcohol. The axis is golden brown proximally and very pale distally.

5. *Plexaura pinnata* new species. (Plate I, figs. 3, 3*a*; Plate IV, fig. 5).

(The locality can not be given, as the label is missing).

Colony flabellate in form, 16 cm. in height and with a spread of 9 cm. The main stem has been broken just above the origin of the first main branch, which thus constitutes practically the entire specimen. This branch bears numerous branchlets in a pinnate manner, but they are neither opposite nor regularly alternate. The calyces are regularly distributed on all sides of the stem and branches, and are about 1 mm. apart.

The individual calyces are included, there being no external swelling except a slight tumidity about the margin, as in other species of this genus. The aperture is quite small, usually round, the tentacles being sunken below the eight-lobed fringe around the inner side of the margin. The polyp is much compressed, when retracted, a longitudinal section being an oval whose width is greater than the length. There are a few delicate spindles in the polyp body and tentacles.

A cross section of the stem shows a moderately thick cœnenchyma, a series of small but well-defined watervascular canals, and an axis with a proportionally large white central core.

Spicules. These are all small, but of several types. Regular, terete spindles with regularly disposed, very prominent verrucæ are common. There are also many double clubs such as KENT calls "laminatoclavate" spicules[1], with a marked constriction around the middle. A number of crosses are also found, the arms of the crosses being tumid and densely tuberculate, forming a four-leaved rosette. While the cœnenchyma is divided into two layers by the watervascular system, I can not determine any constant difference between the spicules of these layers.

Color. The colony in alcohol is very light buffy brown. The axis is dark brown and the spicules colorless.

6. *Plexaura flava* new species. (Plate II, figs. 1, 1*a*; Plate IV, fig. 6).

Stat. 19. Bay of Labuan Tring, West coast of Lombok. 18—27 meters.
Stat. 60. Haingsisi, Samau Island, Timor. Reef. 23 meters.
Stat. 142. Anchorage off Laiwui, coast of Obi Major. 23 meters.
Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters.

A number of fragments of apparently more than one specimen were collected at Station 19. The largest consists of a dense tuft of branches and branchlets, and is 37 cm. long. The main stem is 8 mm. in diameter, and abruptly angulated 2.2 cm. from its base. After giving off one compound, and a number of simple branches, it divides into two approximately equal parts 12.5 cm. from its base. These branches give off numerous compound and simple branchlets. On their proximal portions both the main branches and their compound offshoots give off terminal twigs from all sides. On their distal portions they give off usually simple twigs with a strong tendency to a regularly pinnate arrangement, although occasional twigs are given off from both the front and back of the distal parts of the colony. The pinnæ are about 4 mm. apart, on the average, and about 1.5 mm. in diameter. The main stem is flattened, but the branches are round. The calyces are rather more prominent than in most species of this genus, and are distributed on all sides of the branches, with a tendency to be more crowded on the sides than on the front and back.

The individual calyces show externally as very low verrucæ. The aperture is often completely closed by the contraction of the calyx margin. The polyps are completely retractile, but the tentacles do not sink below the level of the polyp walls. Thus there appears no lobular margin around the calycular mouth, but the tentacles, in retraction, lie immediately below the margin. The tentacles are very deeply fringed. There are a few very minute, bar-like spicules on the body walls and basal parts of the tentacles.

A cross section of a branch shows a rather ill defined series of watervascular canals, and an axis wholly corneous with a rather large central core which is white.

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[1] KENT. On the Calcareous spiculæ of the Gorgonacea. Monthly Microscopical Journal, Feb. 1, 1870, p. 76, plate XLII, figs. 38, 43.

Spicules. The spicules are mainly spindles, straight and curved, relatively large as compared with most of the others in the Siboga collection of this genus, but not so as compared with some other Plexauridæ. A few club-shaped forms are present.

Color. The colony is a light naples yellow, probably brighter when fresh. The axis is brown and the spicules colorless.

This species differs in general appearance from the other species of *Plexaura* in the collection, but the writer is unable to find any structural difference, unless it be in the spicules, which do not seem of a sufficiently different type to warrant its exclusion from the genus.

Plexauroides Wright and Studer (emended).

Plexauroides Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 138.
Plexauroides Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 111.
Plexauroides Brundin. Alcyonarien des zool. Museums in Upsala, 1896, p. 19.
Plexauroides Kükenthal. Japanische Gorgoniden, II. Teil, 1909, p. 27.

The original definition of this genus is as follows:

"Colony branching, mostly in the one plane. Stem and branches cylindrical. Axis horny dense, with the central portion calcareous. Nutrient canals symmetrically arranged. Cœnenchyma thin, consisting of two very distinct layers of spicules, the one nearest the axis is composed of irregular stellate forms, the outer layer of large Blattkeule, the broad foliar expansions of which project beyond the surface of the cœnenchyma forming a rough imbricated surface".

The polyps are numerous, fully retractile, with scarcely visible verrucæ, the edges of these latter being fringed with rows of the broad projecting folia of the Blattkeule.

Kükenthal re-defines the genus so as to exclude *Plexauroides verrucosa* Brundin, and *P. asper* Moroff, which he places in a new genus *Paraplexaura*, which he differentiates from **Plexauroides** mainly on account of short terminal branches and true calyces.

Aside from the original definition, there is no reference to the calcareous core to the axis, and it is not referred to by Brundin in his discussion of the genus. The specimens in the Siboga collection do not show this character, but there is a white core to the axis which is not calcareous. It may possible have deceived the describer of the genus, as it looks very much like a calcareous core.

The spicules are the characteristic feature of the genus, which may be described as follows:

Plexauridæ with a horny axis, long terminal branchlets inserted calyces, cœnenchyma rather thin, but composed of two very distinct layers of spicules. The outer layer is formed of spicules whose proximal part bears branched, warty radiating processes projecting downward and outward; and whose distal portions are composed of broad, leaf-like expansions standing at right angles to the surface of the branch when in situ. The inner layer of spicules is composed of smaller cruciform or stellate forms.

The type of this genus is *Plexauroides prœlonga* (Ridley). The other known species are *Plexauroides indica* Ridley, *P. unilateralis* Studer, *P. lenzii* Studer, *P. michelsoni* Kükth., *P. rigida* Kükth., *P. simplex* Kükth. and *P. filiformis* Kükth.

This genus has much in common with the genus *Eunicella* Verrill, especially in the form of the spicules.

1. *Plexauroides prælonga* (Ridley).

Plexaura prælonga Ridley. Report on the Zoological Collections of H. M. S. Alert, 1884, p. 339.
Plexauroides prælonga Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 138.
Plexaura prælonga, var. *elongata* Thomson and Henderson. Ceylon Pearl Oyster Fisheries Report, Alcyonaria, 1905, p. 305.

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. (Pearl Banks). 13 meters.

Colony (dried) flabellate in form, 62 cm. in height and about 20 cm. in spread. The main stem gives off a large branch 9 cm. from its base, and this bears several lateral branches which are usually simple and attain a length of as much as 24 cm. The remainder of the colony consists of the continuation of the main stem and its branches. These latter are roughly alternate in position and tend to divide dichotomously until branches of the third order are produced. The terminal twigs are very long and slender. The diameter of the main stem is 9 mm., and of the branches about 3 mm. The calyces are entirely inserted, and are so completely immersed that only their openings are seen. They are evenly distributed on all sides of the branches, their mouths being about 1 mm. apart.

Nothing but the openings of the individual calyces are to be seen in the dried specimens. These are oval and less than 1 mm. in their longer diameter. The polyps could not be seen in the specimens at hand.

A cross section of a branch shows a very thick cœnenchyma with a superficial layer of "Blattkeulen" standing at right angles to the surface, and an inner layer of colorless cruciform or stellate spicules. The watervascular canals are large and conspicuous. The axis cylinder has a white, noncalcareous core.

Spicules. These are mainly typical "Blattkeulen" with a branched and densely tuberculate basal portion and a distal, disk-like comparatively smooth part. This latter portion is often inflated in appearance and approaches very closely the *Echinogorgia* type, as pointed out by Studer in his study of *Plexauroides lenzii* [1] besides these, which are by far the most numerous, there are cruciform and stellate spicules of much smaller size.

Color. The colony is bright crimson. The axis is black, fading distally to a light greenish brown. The spicules are bright red.

General distribution. The type was secured in Torres Strait. The Challenger found it off Cape York at a depth of 8 fathoms. It was secured also from the Pearl Banks of Ceylon.

This is a very beautiful and well marked species.

2. *Plexauroides lenzii* Studer.

Plexauroides lenzii Studer. Alcyonarien aus der Sammlung des Naturh. Museums in Lübeck, 1894, p. 114.

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[1] Alcyonarien aus der Sammlung des Naturh. Museums in Lübeck, 1894, p. 114.

Stat. 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion.
Stat. 273. Anchorage off Pulu Jedan. East coast of Aru Islands. (Pearl Bank). 13 meters.

Colony flabellate in form, 21 cm. in height and about 16 cm. in diameter. The main stem forks about 2.5 cm. from its base, and one of the resulting divisions again forks, making three main branches to the colony, which give off lateral branches in a very irregular manner, often redividing until branchings of the 5th and 6th orders are attained. The diameter of the main stem is 6 mm., of the main branches 5 mm. and of the slender, straight ultimate branches 2 mm. The calyces are evenly distributed on all sides of the stem and branches, their mouths being ordinarily about 1 mm. apart from centre to centre.

The individual calyces are included, there being nothing visible externally except a very slight swelling around the margins, this swelling fading insensibly into the general surface of the cœnenchyma. The calyx walls are covered with the imbricating scales or foliar expansions of Blattkeulen that form the distal portions of the superficial layer of spicules. The polyps are completely retractile, the calycine apertures being in most cases obliterated. The retracted polyps are very much flattened, being really reduced to disk-shaped bodies. There are a few slender spicules on the upper surfaces of the tentacles, there usually being two longitudinally disposed on each tentacle.

A cross section of a branch shows the two layers of spicules characteristic of the genus, the outer with the scarlet foliar expansions standing erect, as if radiating from the axis. The inner layer is composed of colorless spicules which are small and of various forms. The water-vascular canals are not well differentiated, and the axis is horny, sometimes with a hollow centre.

Spicules. The Blattkeulen are like those of the *Echinogorgia* type found in the Muriceidæ, but the smooth, distal foliar expansions are aggregated into a knob-like head. Sometimes this is much flattened so as to become disk-shaped. The proximal, immersed parts of these spicules bear dense masses of tuberculated or branched processes reaching downward and outward. Besides these there are a number of tuberculate spindles, crosses, butterflies, clubs, etc. which are found in the inner layer of the cœnenchyma.

Color. The colony is bright scarlet, as are the Blattkeulen.

The specimens collected by the Siboga Expedition do not show the calcareous core to the axis cylinder described by STUDER. They agree, however, so well in all other particulars that the writer feels confident of the correctness of his identification.

Euplexaura Verrill (emended).

Euplexaura Verrill. Proceedings of the Essex Institute, VI, 1869, p. 143.
Euplexaura Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 143.
Euplexaura Brundin. Alcyonarien des Zool. Museums in Upsala, 1896, p. 20.
Euplexaura Kükenthal. Japanische Gorgoniden, II. Teil, 1909, p. 6.

The orginal description of the genus is as follows:

"In external characters it resembles *Plexaurella*, with rather large, open cells. The spicula are mostly stout, blunt, warty spindles, and rarely small, irregular crosses".

Wright and Studer add to this description the character of the axis, which is really the best diagnostic feature of the genus. After quoting Verrill's definition they add:

"To this may be added that in the structure of the axis there is a general resemblance to that of *Plexaurella*".

In spite of this "general resemblance", however, there is a very distinct difference between the axis of *Plexaurella* and that of *Euplexaura*. In a cross section of a branch of a typical species of *Plexaurella* the clear, horny core is surrounded by a thick envelope which is composed of a number of long, vermiform, white calcareous bodies enclosed in a casing of chitin. In a similar section of *Euplexaura* no such definite structure of the axis is seen; but there is a central core of pure, translucent, horny material around which is a thick cylinder of horny material extensively impregnated with lime salts. These latter sometimes seem to take the form of fibres, but are not nearly so distinct and white as the vermiform bodies of *Plexaurella*. The axis of the latter genus is excellently well illustrated by Kölliker, Icones Histologicæ, II, plate XIV, fig. 8. It has also been described and figured by the present writer[1].

Kükenthal has emended the definition of this genus in so satisfactory a manner that we may adopt his diagnosis, which is as follows:

"Kolonien in einer Ebene verzweigt. Polypen fast stets ohne gesonderte Kelche direkt in das dicke Cœnenchym zurückziehbar. Polypen stets mit konvergierenden Reihen von Spindeln bewehrt, unter denen horizontal angeordnete liegen. Die Rinde enthält an der Oberfläche dicke, meist ovale Spindeln und Doppelspindeln, die dicht mit grossen Warzen besetzt sind, darunter liegen kleinere, schlankere Spindeln mit regelmässigen Dornengürteln. Achse fast stets etwas verkalkt und wenig biegsam. Die Färbung sämtlicher Arten schwankt zwischen weiss, gelblich und hellbraun".

The type of the genus *Euplexaura* is *Euplexaura capensis* Verrill. The other known species are *Euplexaura pinnata* Wright and Studer, *E. rhipidalis* Studer, *E. parciclados* Wright and Studer, *E. anastomosans* Brundin, *E. curvata* Kükth., *E. robusta* Kükth., *E. crassa* Kükth., *E. abietina* Kükth., *E. sparsiflora* Kükth., *E. erecta* Kükth., *E. albida* Kükth., *E. braueri* Kükth., *E. parva* Kükth., and the new species about to be described.

1. *Euplexaura rubra* new species. (Plate III, figs. 3, 3*a*; Plate IV, fig. 7).

Stat. 164. 1°42'.5 S., 130°47'.5 E. Near New Guinea. 32 meters.

Colony incomplete, about 8 cm. long. The basal part is lacking, and it appears that we have but the terminal portion of the main stem, or large branch, giving off two small lateral branches on one side, and one on the other. The stem and branches are round in section, the diameter of the former being 2.5 mm. and of the branches about 1.5 mm. The calyces are rather prominent for this family, and are equally distributed on all sides of the branches.

The individual calyces are coninal in form, a typical one measuring about 1 mm. in height and 1.4 mm. across the base. The polyps are completely retractile, the summits of the calyces closing over them, but showing an eight-rayed margin. The polyps are very small, and it is difficult to make out their characters of spiculation on account of the intimate cohesion of the polyp and calyx walls. It seems, however, that there are a few spindles longitudinally arranged on the walls and tentacles.

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[1] Nutting, Anatomy of the Gorgonidæ, Bulletin from the Laboratories of Natural History of the State University of Iowa, Vol. 1, N⁰ 2, 1889, p. 129, plate II, figs. 8, 9 and 10.

A cross section of a branch shows the ordinary features of this family, except the structure of the axis cylinder. This has a very decided intercalation of lime salts, the axis appearing to be composed of fibres between which are deposited the calcareous particles in such quantities that the axis boils violently when immersed in dilute acid. The watervascular canals seem fewer and more widely separated than is common in the Plexauridæ.

Spicules. These are all densely tuberculated spindles which are so short as to become oval in outline, and to resemble the disk-like forms of some species of *Placogorgia*. There is little variation, except in size, probably due to age.

Color. The colony is scarlet throughout, except the polyps, which still show a yellowish color in alcohol and were probably bright yellow in life.

2. *Euplexaura mollis* new species. (Plate III, figs. 4, 4*a*; Plate IV, fig. 8).

Stat. 299. 10° 52'.4 S., 123° 1'.1 E. Cyrus Bay, Rotti Island. 34 meters.

Colony incomplete, flabellate and reticulate. The proximal part is missing, the specimen being 27 cm. in height and 15 cm. broad. The main stem, or branch, forks about 3 cm. from its proximal end, and behind this forking a thick stump of a branch is directed backward and a little downward. One branch of the fork is cut off 6.5 cm. from its base and is connected by heavy anastomoses with the other branch. This latter forms the main part of the colony, a central stem proceeding nearly to the periphery where it is dissipated in the reticulation. The ultimate twigs are slender and but little over 1 mm. in diameter. The calyces are distributed on all sides of the branches, their openings being about 1 mm. apart.

The individual calyces are almost entirely included in the cœnenchyma, and show externally as low, dome-shaped verrucæ with small round apertures, in the dried specimen. The polyps are small and retracted so that their infolded tentacles are almost on a level with the calyx margin in alcoholic specimen. The margin is lined with an eight-lobed membrane caused by the infolding of the œsophageal region of the polyp. The infolded tentacles are provided with a pseudo-operculum much like that of the Muriceidæ.

A cross section of a branch shows a moderately thick cœnenchyma with two layers of spicules imperfectly divided by the series of watervascular canals, but not showing two distinct kinds of spicules. The axis cylinder is full of intercalated particles of lime salts, as in the last species, and effervesces violently in weak acid solution.

Spicules. The spicules of this species are all small, even minute, in comparison with others of the family. The most common form is a small terete spindle with relatively large tubercles arranged in definite whorls. There are also minute globular forms, crosses and dumb-bells.

The small size of the spicules renders the surface much smoother than is usual, and the cœnenchyma is sponge-like in texture.

Color. The colony is dull, rather light, brown, or dust color.

3. *Euplexaura reticulata* new species. (Plate III, figs. 2, 2*a*; Plate IV, fig. 9).

Stat. 38. 7° 35.4 S., 117° 28'.6 E. Near Paternoster Islands. 521 meters. Coral.
Stat. 117. 1° 0.5 N., 122° 56' E. Kwandang Bay, North Celebes. 80 meters. Sand and coral.
Stat. 144. Anchorage north of Salomakiëe (Damar) Island. 45 meters. Coral bottom and Lithothamnion.

The type of this species is a mere fragment, but is plainly different from others of this genus in the collection. Colony flabellate and reticulate, the part preserved being evidently from near the margin of the colony and showing the anastomoses of the branches. The fragment is 3.2 cm. long, and consists of a main branch which gives off two branchlets from one side. The lower of these gives origin to three short stubs of branches from its outer side and sends forth another on the opposite side, which anastomoses with the main stem. The greatest diameter of the stem, near the base is 2 mm., and the least diameter of twigs is 1.2 mm. The calyces seem to be more unevenly distributed than in other species, being almost contiguous in some places and as much as 2 mm. apart in others.

The individual calyces, while not much exserted, have sharply cut margins and are therefore more pronounced than in other species of the genus in the collection. When open they have the form of low truncated cones, and when closed they appear as low domes. When the polyp is fully retracted a series of eight points are seen directed towards the centre. These points constitute a pseudo-operculum on the dorsal side of the retracted tentacles. Each opercular flap consists of several spindles arranged en chevron on the proximal part of tentacle, and a number of longitudinal spindles on the distal part. There is also a well marked collaret.

A section of a branch shows the same features as have been described in the preceding species. The axis contains a number of calcareous fibres that can be separated by boiling in potash.

Spicules. The spicules are mainly small, but hardly minute, terete spindles which are densely tuberculate, the tubercles seldom appearing to be in definite whorls. The spindles are quite uniform in character.

Color. The fragment is light grayish brown.

Two specimens of this species were found in the collection after the above description was written. They are much larger than the type, but neither is complete. One of them is 12 cm. in length, and both are plainly reticulate.

Hicksonella new genus.

Plexauridæ with a thick cœnenchyma, calyces included and on all sides of the branches, horny axis cylinder, and two very different types of spicules. One type consists of very small, short, warty spindles, and the other of comparatively large, slender, bar-like, smooth spindles sometimes attaining a length of 1.2 mm.

The type species of this genus is *Hicksonella princeps* Nutting.

Just as the two types of spicules furnish the generic distinction that is most prominent in the genus *Plexauroides*, so two very different forms of spicules are here used as the diagnostic features of the genus *Hicksonella*, which the author takes pleasure in naming after the accomplished naturalist Professor SYDNEY J. HICKSON who has done such important work in the Alcyonaria.

1. *Hicksonella princeps* new species. (Plate III, figs. 1, 1*a*; Plate IV, fig. 10).

Stat. 240. Banda Anchorage. 9—45 meters. Sand and coral.
Stat. 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion.

Colony densely arborescent, forming a profusely branched clump 17 cm. in height and 15 cm. in diameter. Immediately above the base the colony divides into two large trunks, each of which divides in an irregular manner until branches of the seventh order are sometimes attained. The larger branches tend to divide by sending off branchlets in the same plane, thus forming a palmate structure of the main branch. Many of the secondary branches send off a number of closely approximated branchlets from one side. The distal portions of the colony consists of very numerous twigs in dense tufts, the ultimate branches being very short. The diameter of the colony at base is 1.3 cm., of the main branches .5 cm. and of the ultimate twigs 3 mm. Some of the larger branches are somewhat flattened, but the others are round. The calyces are thickly implanted on all sides of the stem and branches. In alcoholic specimens they are in the form of very low verrucæ, which are much less pronounced in dried specimens.

The individual calyces are included, small, round, with their margins but slightly elevated above the level of the cœnenchyma. The openings are usually quite round, but are sometimes oval. The polyp in retraction sinks far below the surface. Inside the calyx margin is a proportionately small border with eight undulations surrounding a central aperture below which the retracted tentacles lie.

A cross section of a branch shows a thick cœnenchyma, large and regularly arranged watervascular canals, and a horny axis cylinder with an exceptionally small central core of white noncalcareous substance. No definite layers of spicules can be made out, although there seems to be a distinct pellicle of cœnenchyma between the watervascular canals and the axis.

Spicules. These are of two very distinct kinds. By far the more numerous are quite small, short, densely tuberculated spindles, so short as to be oval in outline and entirely covered with verrucæ. The second type is comparatively large slender, almost smooth, bar-like or terete spicules attaining a length of 1.3 mm. Often one half is quite smooth and glassy, while the other is finely tuberculate, the tubercles being very small. I am unable to find any definite anatomical relations of these large spicules. In some cases their blunt smooth points were seen projecting outward from the calyx walls. They are sparsely and irregularly distributed.

Color. The colony is light buffy brown. The spicules are colorless.

A specimen of this species labeled from Station 315 is 95 cm. in length. In the one from Station 240 the large spicules are sometimes arcuate, but otherwise resemble those described above.

Psammogorgia Verrill.

Psammogorgia Verrill. American Journal of Science and Arts, XLV, 1868, p. 413.
Psammogorgia Verrill. Transactions Connecticut Academy of Sciences, Vol. I, Part 2, 1867—71, p. 414.
Psammogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LIX.
Psammogorgia Nutting. Alcyonaria of the Californian Coast. Proceedings of the U.S. National Museum, Vol. XXXV, 1909, p. 719.

The original description of this genus by VERRILL is as follows:

"Corallum dichotomous or subpinnate, with round branches. Axis horn-like. Cœnenchyma moderately thick, the surface finely granulated with small rough spicula. Cells scattered, sometimes flat, more frequently raised in the form of rounded verrucæ. Polyps with rather large elongated, slender, warty spindles at the bases of the tentacles. Spicules of the cœnenchyma mostly short, thick and very rough, warty spindles and rough, warty clubs of moderate size".

As the author has remarked on another occasion (loc. cit.) this genus does not conform very well to the accepted characters of the family Plexauridæ, particularly in the absence of regularity in the disposition of the watervascular canals.

The species grouped together by professor VERRILL under the name *Psammogorgia* seem to be nearer this family, however, than any other thus far described, and the present writer prefers to follow VERRILL in regarding it as an aberrant genus of Plexauridæ rather than to raise it to family rank.

The type of the genus is *Psammogorgia arbuscula* Verrill. The other known species are *Psammogorgia fusca* Verrill, *P. fucosa* Verrill, *P. gracilis* Verrill, *P. simplex* Nutting, *P. spauldingi* Nutting, *P. teres* Verrill and *P. torreyi* Nutting.

1. *Psammogorgia arbuscula* Verrill.

Echinogorgia arbuscula Verrill. Proceedings Boston Society of Natural History, Vol. X, 1866, p. 329.
Psammogorgia arbuscula Verrill. American Journal of Science and Arts, XIV, 1868, p. 413.
Psammogorgia arbuscula Verrill. Transactions Connecticut Academy of Arts and Sciences, Vol. I, Part 2, 1867—71, p. 414.
Psammogorgia arbuscula Nutting. Alcyonaria of the Californian Coast, 1909, p. 719.

Stat. 262. 5° 53'.8 S., 132° 48'.8 E. Between Kei Islands. 560 meters. Mud.

Colony subflabellate in form, attaining a height of 22 cm. About 3 cm. from its base the main stem divides into three branches, two of which are subequal and form the main part of the colony. The third is smaller and bears two short, distant branches on the same side. The other two are joined by the anastomoses of two branchlets, one from each. One of them gives off two other branches from one side, and the other but one. The terminal branches are all long and slender, in one case attaining a length of about 19 cm. They are of about the same diameter (3 mm.) throughout. The calyces are unevenly distributed on all sides of the branches, although there are long bare species on the back of some of the branches. Otherwise they average about 2.5 mm. apart.

The individual calyces are very low verrucæ, scarcely elevated above the general level of the cœnenchyma and about 2 mm. in diameter. The verrucæ are surmounted by an eight-lobed margin. Their walls are filled with spindles which appear to be closely packed without definite arrangement. The polyps are completely retractile, but are often seen, in alcoholic specimens, with the tentacles resting above the margin and forming an acorn-shaped mass.

The body walls have eight longitudinal rib-like bands of parallel spindles which continue over the dorsal surface of the tentacles.

The cœnenchyma is thick, and a cross section of a branch shows that the watervascular canals are not regular in arrangement. The axis is entirely horny.

Spicules. Slender acute spindles predominate, often with a narrow but well defined bare zone in the centre. A few clubs are seen, also short, bar-like forms quite distinct from the numerous slender spindles.

Color. The colony is bright coral red, as are the spicules.

General distribution. Panama, and the Pacific Coast of Nicaragua, (VERRILL). The Californian Coast, (NUTTING).

DISTRIBUTION OF THE PLEXAURIDÆ COLLECTED BY THE SIBOGA EXPEDITION.

List of Stations

at which Plexauridæ were collected by the Siboga Expedition, and a
List of Species collected at each Station.

STATION 19. 8°44'.5 S., 116° 2'.5 E. West Coast of Lombok. 18—27 meters. River mud, coral, coral sand. *Plexaura flava.*

STATION 38. 7° 35'.4 S., 117° 28'.6 E. Near Paternoster Islands. 521 meters. Coral. *Euplexaura reticulata.*

STATION 43. Anchorage off Pulu Sarassa, Postillion Islands. Up to 36 meters. Coral. *Plexaura platystoma.*

STATION 58. Anchorage off Seba, Savu. Up to 27 meters. Sand. *Plexaura aggregata.*

STATION 60. Haingsisi, Samau Island, near Timor. 23 meters. Lithothamnion in 3 meters and less. Reef. *Plexaura flava.*

STATION 65ª. 7° 0' S., 120° 34'.5 E. Depth changing rapidly from 400—120 meters. Coral bottom. *Plexaura aggregata.*

STATION 117. 1° 0'.5 N., 122° 56' E. Kwandang Bay entrance, North Celebes. 80 meters. Sand and coral. *Euplexaura reticulata.*

STATION 142. Anchorage off Laiwui, coast of Obi Major. 23 meters. Mud. *Plexaura flava.*

STATION 144. Anchorage North of Salomakië (Damar) Island. 45 meters. Coral bottom and Lithothamnion. *Euplexaura reticulata.*

STATION 162. Between Loslos and Broken Islands, West Coast of Salawatti. 18 meters. Coarse and fine sand, with clay and shells. *Plexaura attenuata.*

STATION 164. 1° 42'.5 S., 130° 47'.5 E. Near New Guinea. 32 meters. Sand, small stones and shells. *Plexaura attenuata, Euplexaura rubra.*

STATION 213. Saleyer Anchorage and surroundings. Up to 36 meters. Mud with sand. *Plexaura aggregata.*

STATION 240. Banda Anchorage. 9—45 meters. Black sand, coral, Lithothamnion bank in 18—36 meters. *Hicksonella princeps.*

STATION 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral. *Plexaura aggregata, Plexauroides lenzii.*

STATION 262. 5° 53'.8 S., 132° 48'.8 E. Arafura Sea. 560 meters. Solid bluish gray mud. Upper layer more liquid and brown mud. *Psammogorgia arbuscula.*

STATION 273. Anchorage off Pulu Jedan, East coast of Aru Islands, (Pearl Banks). 13 meters. Sand and shells. *Plexaura flava, P. recta, Plexauroides prælonga, P. lenzii.*

STATION 285. 8° 39'.1 S., 127° 4'.4 E. Timor Sea. 34 meters. On the limit between mud and coral. Lithothamnion. *Plexaura attenuata, Euplexaura rubra.*

STATION 299. 10° 52'.4 S., 123° 1'.1 E. Cyrus Bay, Rotti Island. 34 meters. Mud, coral and Lithothamnion. *Plexaura recta, Euplexaura mollis.*

STATION 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion. *Plexaura aggregata, Hicksonella princeps.*

Specimens of *Plexaura recta* from Pulu Missa near Flores. J. H. DE SISO don.

Plexaura pinnata. Locality unknown, as the label is missing.

The list shows that Plexauridæ were collected at 19 of the stations occupied by the Siboga Expedition. As there appear to be somewhat more than 200 successful hauls from the bottom it follows that members of this family were secured by about 10°/₀ of these hauls, showing that the family is meagerly represented in this region in comparison with the Muriceidæ. No station yielded more than four species, while one Station (310) yielded no less than 17 species of the Muriceidæ.

But two species of Plexauridæ were secured at depths of over 500 meters. One of these was *Euplexaura reticulata*, from a depth of 521 meters; another was *Psammogorgia arbuscula*, from a depth of 560 meters.

The family thus appears to be largely restricted to moderately shallow water, which may in part account for the wide difference between the Atlantic and Pacific plexaurid faunæ.

The genus *Plexauroides* is the only one in which species previously recorded are found. *Plexauroides prælonga* has been reported from Australian waters and Ceylon, and *P. lenzii* is known to occur near Singapore. Neither of these localities is far from the East Indian region.

So far as the Siboga material bears testimony concerning the distribution of the Plexauridæ, that testimony is negative regarding the occurrence of species in both the Atlantic and Pacific. It is also a notable fact that the genera *Eunicea* and *Plexaurella*, both furnishing numerous species from the West Indies, are not at all represented in the Siboga collections.

As indicated above, the restricted bathymetric range of most of the known species of this family may account for the correspondingly restricted geographic range. Caution must be exercised, however, in drawing general conclusions from the limited information at our disposal.

Literature cited

in the Report on the Plexauridæ of the Siboga collection.

BRUNDIN, J. A. Z. Alcyonarien aus der Sammlung des Zoologischen Museums in Upsala. Bihang til k. Svenska Vet.-Akad. Handlingar, Band 22, Heft IV, N⁰ 3. Stockholm, 1896.

DUCHASSAING et MICHELOTTI. Mémoire sur les Coralliaires des Antilles, Turin, 1860.

GRAY, J. E. On the Arrangement of Zoophytes with Pinnated Tentacles. Annals and Magazine of Natural History, 3th. Series, Vol. 5, London, 1859.

KÖLLIKER, A. Icones histiologicæ, oder Atlas der vergleichenden Gewebelehre; 2te Abtheilung, der feinere Bau der höheren Thiere; 1stes Heft, die Bindesubstanz der Cœlenteraten, Leipzig, 1865.

KÜKENTHAL, W. Japanische Gorgoniden, II. Teil; Die Familien der Plexauriden, Chrysogorgiiden und Melitodiden. München, 1909.

LAMOUROUX, J. F. V. Histoire des Polypiers coralligènes flexibles, Paris, 1816.

—— Exposition Méthodique des Genres de l'ordre des Polypiers, Paris, 1821.

MILNE EDWARDS et HAIME. Histoire naturelle des Coralliaires, Vol. I, 1857.

NUTTING, C. C. Alcyonaria of the Californian Coast. Proceedings of the U. S. National Museum, Vol. XXXV, Washington, 1909.

RIDLEY, S. O. The Coral Fauna of Ceylon, with Descriptions of New Species. Annals and Magazine of Natural History, 5th. Series, Vol. 11, London, 1883.

—— Report on the Zoological Collections of H. M. S. "Alert", London, 1884.

STUDER, TH. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck. Separatabdruck aus den Mitteilungen der Geographischen Gesellschaft und des Naturhistorischen Museums in Lübeck, II. Ser., Heft 7 und 8, Lübeck, 1894.

VERRILL, A. E. Review of the Corals and Polyps of the West Coast of America. Transactions of the Connecticut Academy of Arts and Sciences, Vol. I, Part 2, New Haven, 1867—71.

—— Proceedings of the Essex Institute, VI, 1869.

—— Critical remarks on the Alcyonoid Polyps in the Museum of Yale College, with descriptions of the New Genera. The American Journal of Science and Arts, Vol. XLV, New Haven, 1868.

WRIGHT, E. P. and STUDER, TH. Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873—76. The Voyage of H. M. S. Challenger, Zoology, Vol. XXXI, 1889.

EXPLANATION OF PLATES

The photographs were made from nature by the author.
The spicules were drawn under the camera lucida by Mr. Dayton Stoner.

PLATE I.

Fig. 1. *Plexaura aggregata* n. sp. Natural size. 1 *a*, part of branch × 5.
Fig. 2. *Plexaura attenuata* n. sp. Natural size. 2 *a*, part of branch × 5.
Fig. 3. *Plexaura pinnata* n. sp. Natural size. 3 *a*, part of branch × 5.

UNIV. OF CALIFORNIA

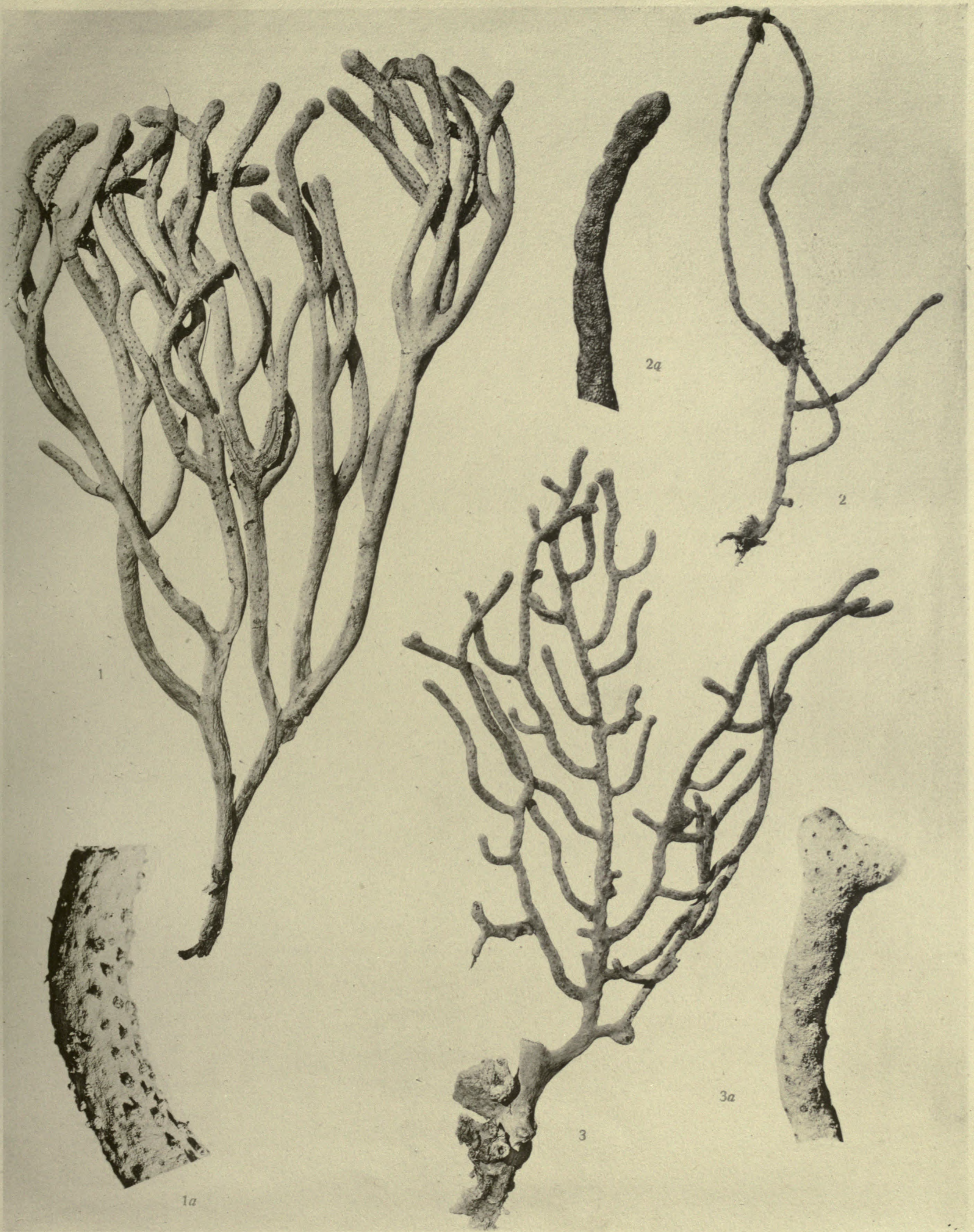

PLATE II.

Fig. 1. *Plexaura flava* n. sp. Natural size. 1 *a*, part of branch × 5.
Fig. 2. *Plexaura platystoma* n. sp. Natural size. 2 *a*, part of branch × 5.
Fig. 3. *Plexaura recta* n. sp. Natural size. 3 *a*, part of branch × 5.

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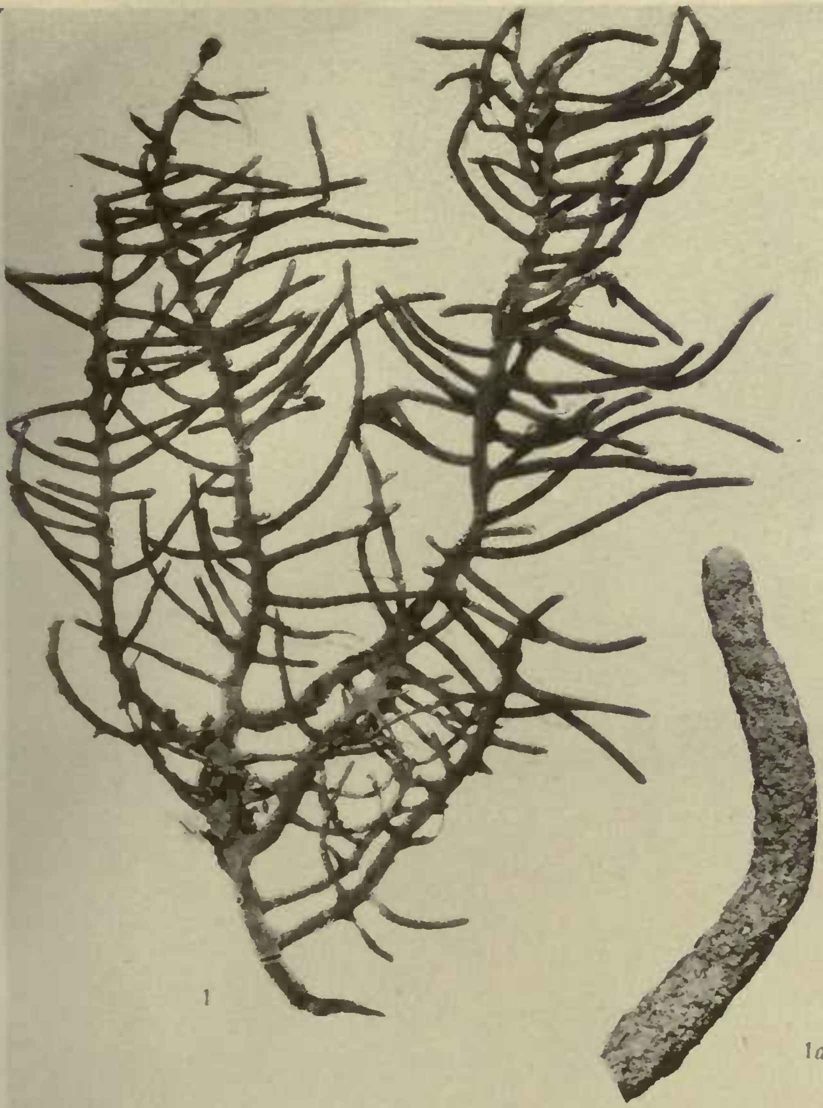

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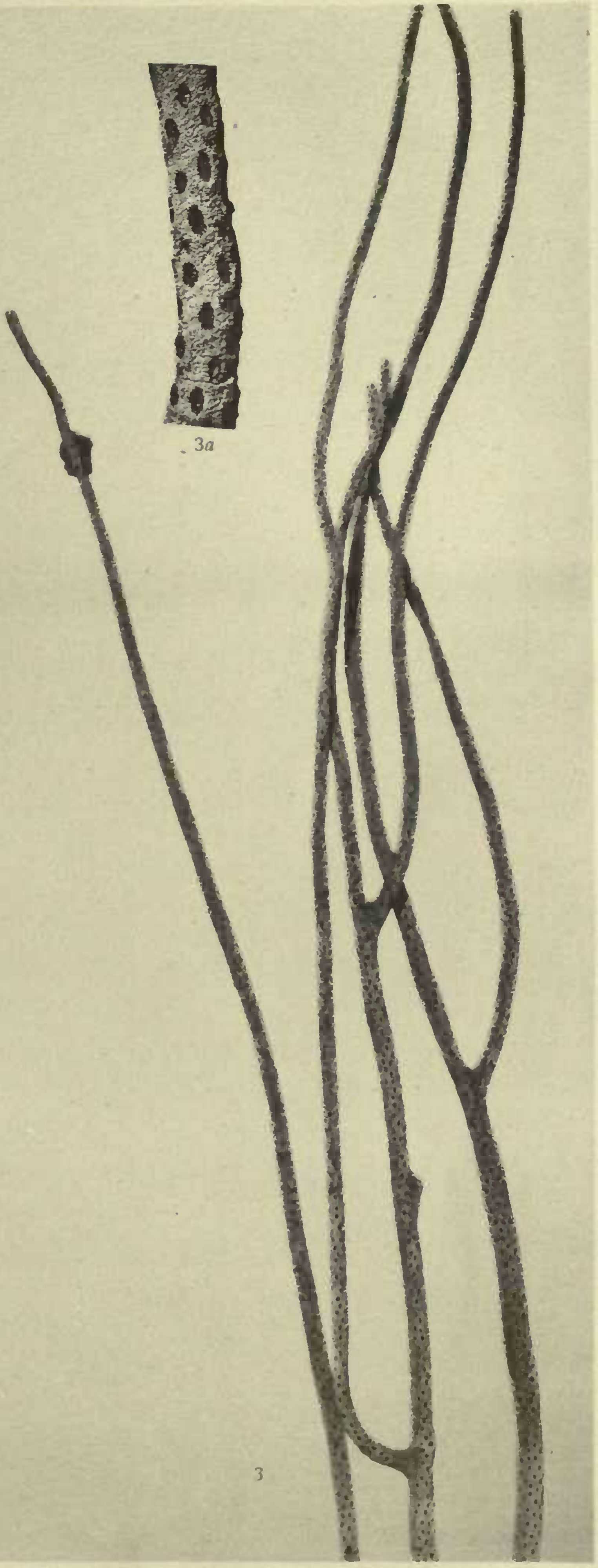

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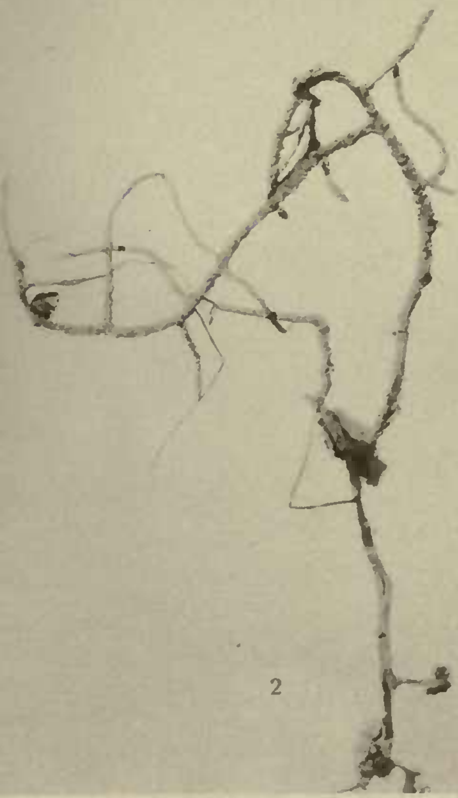

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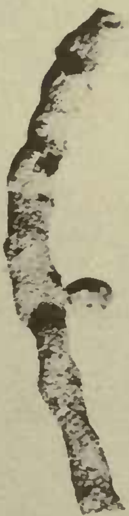

2a

PLATE III.

Fig. 1. *Hicksonella princeps* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Euplexaura reticulata* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Euplexaura rubra* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Euplexaura mollis* n. sp. Natural size. 4*a*, part of branch × 5.

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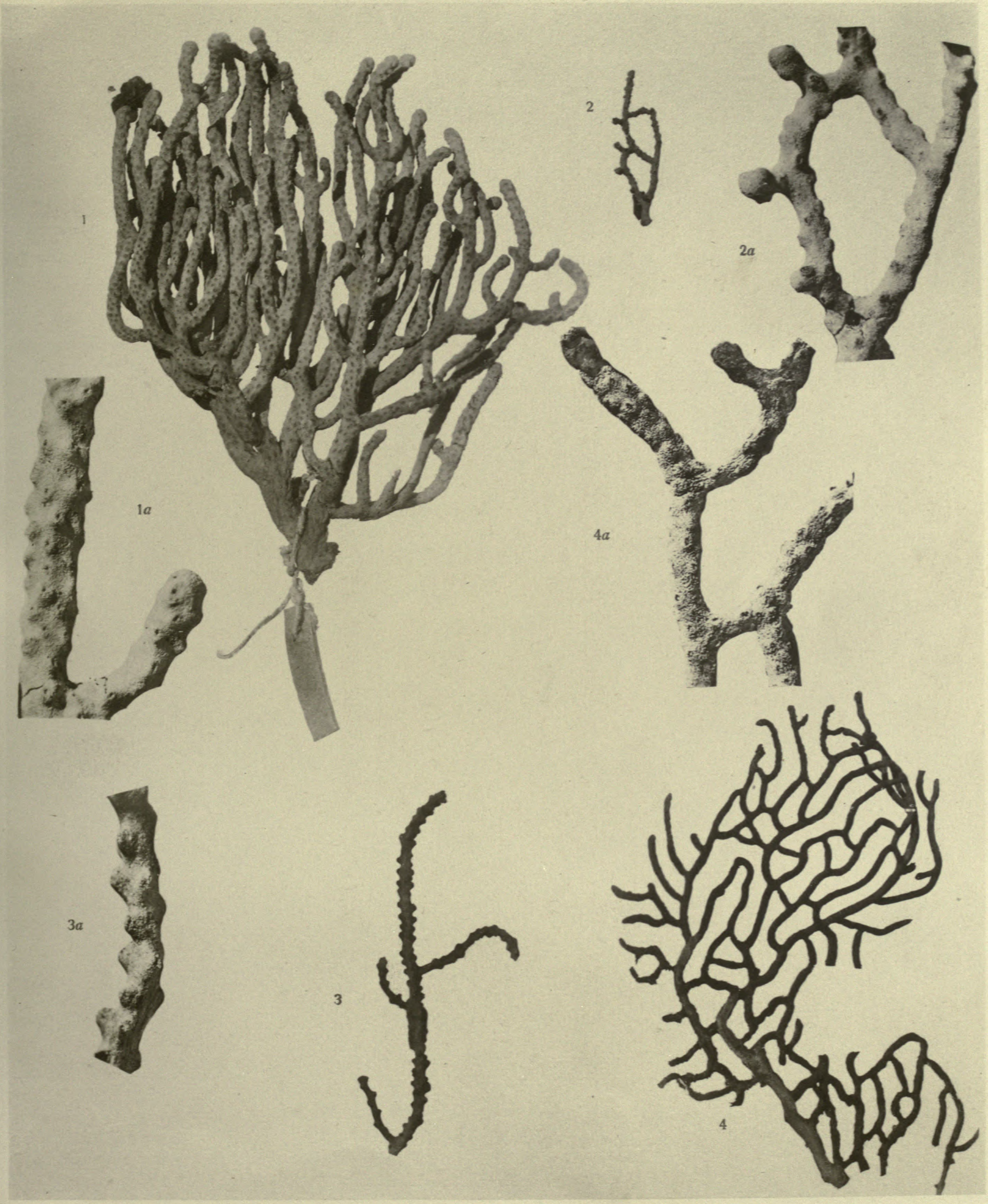
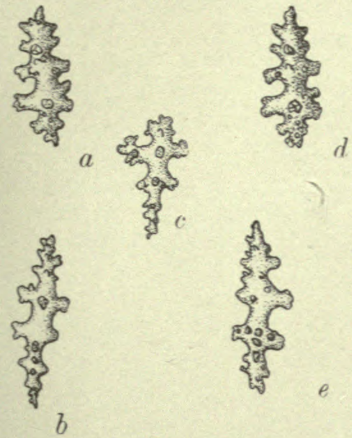

1
2
2a
1a
4a
3a
3
4

PLATE IV.

Fig. 1. *Plexaura aggregata* n. sp. Group of 5 spicules, *a, b, c, d, e.* × 112.
Fig. 2. *Plexaura attenuata* n. sp. Group of 3 spicules, *a, b* and *c.* × 112.
Fig. 3. *Plexaura recta* n. sp. Group of 3 spicules, *a, b* and *c.* × 112.
Fig. 4. *Plexaura platystoma* n. sp. Group of 3 spicules, *a, b* and *c.* × 112.
Fig. 5. *Plexaura pinnata* n. sp. Group of 4 spicules, *a, b, c, d.* × 112.
Fig. 6. *Plexaura flava* n. sp. Group of 4 spicules, *a, b, c, d.* × 112.
Fig. 7. *Euplexaura rubra* n. sp. Group of 3 spicules, *a, b* and *c.* × 112.
Fig. 8. *Euplexaura mollis* n. sp. Group of 4 spicules, *a, b, c* and *d.* × 112.
Fig. 9. *Euplexaura reticulata* n. sp. Group of 4 spicules, *a, b, c, d.* × 112.
Fig. 10. *Hicksonella princeps* n. sp. Group of 6 spicules; *a, b, c, d, e* and *g.* × 112.
a and *b* represent one of the two general types, and the rest the other, or tuberculate type.



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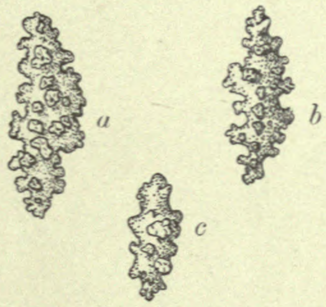

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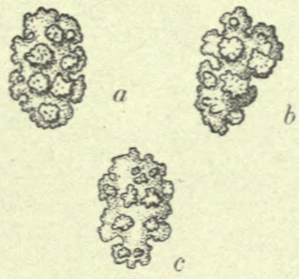

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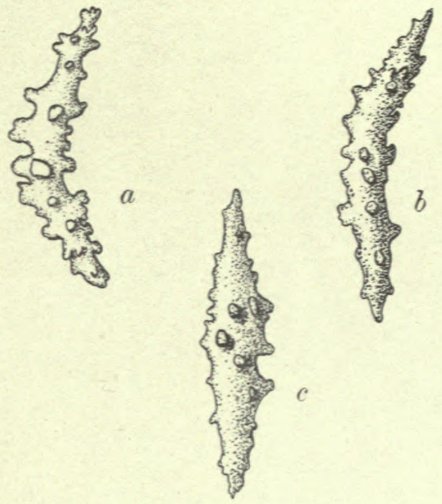

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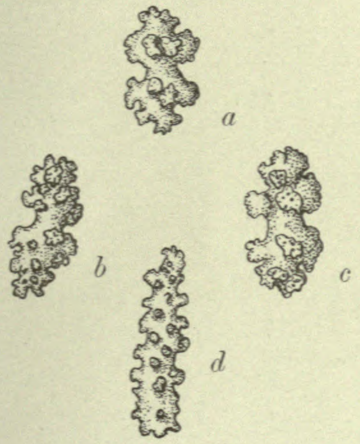

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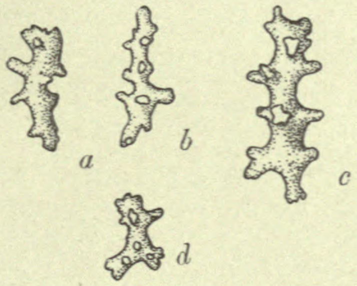

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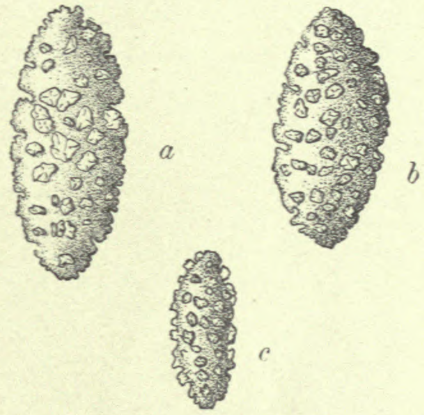

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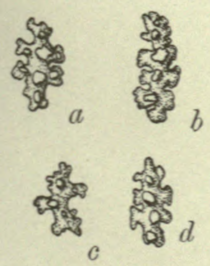

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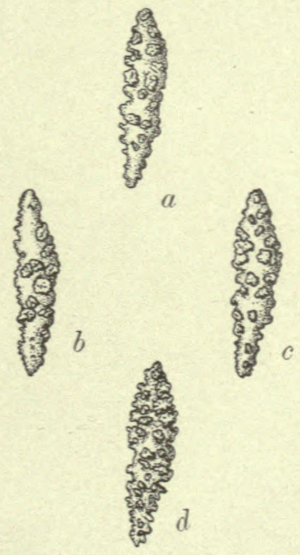

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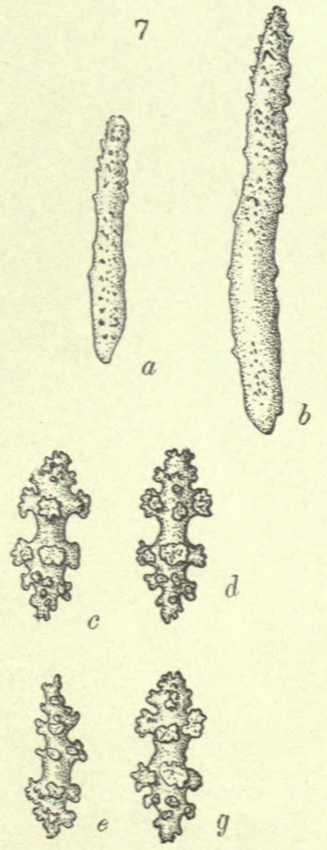

10

THE GORGONACEA OF THE SIBOGA EXPEDITION

V. THE ISIDÆ

Siboga-Expeditie
XIII b²

THE
GORGONACEA OF THE SIBOGA EXPEDITION

V. THE ISIDÆ

BY

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With 6 plates

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The earlier writers usually included the species now allotted to the family *Melitodidæ* in the old genus *Isis*, thus involving the classification of the *Isidæ* in considerable confusion.

KÖLLIKER (1865) with his usual clear insight, separated the "*Melithæacea*" and Isidinæ as distinct subfamilies of his Gorgonidæ, using the characters of the axis cylinder.

GRAY (1870) established the families *Isidæ*, *Mopseadæ*, *Acanelladæ* and *Keratoisidæ*, all of which are now included in the single family *Isidæ*.

STUDER (1887) gave a careful diagnosis of the family *Isidæ*, and divided it into the subfamilies *Ceratoisidinæ*, *Primnoisidinæ* and *Isidinæ*. Later (1889), in the Challenger Report, WRIGHT and STUDER defined the family as follows:

"Colony consisting of a simple or branched axis. The axis consists of calcareous and horny (internodal and nodal) regions; the branches when present arising from either the nodal or internodal regions, sometimes anastomosing; the axis solid or hollow, smooth, fluted or echinulate. The base of the axis calcareous and attached".

To avoid any confusion of certain species of the *Melitodidæ* with the *Isidæ*, this definition, although substantially correct, may be modified for the purposes of the present work as follows:

Gorgonacea with an axis composed of alternating calcareous and horny segments, the former being amorphous and not composed of a mass of agglutinated spicules, and the latter entirely horny without the admixture of definite calcareous spicules.

Several authors have proposed breaking up this family into subfamilies; but with the increase of our knowledge of the group this becomes increasingly difficult. GRAY (1870) went to the extreme of placing the species now included in the *Isidæ* into four distinct families, viz. *Mopseidæ*, *Acanelladæ*, *Keratoisidæ* and *Isidæ*.

VERRILL (1883) separates all but the genus *Isis* into a family *Ceratoisidæ*, which therefore includes GRAY's *Keratoisidæ*, *Acanelladæ* and *Mopseidæ*. STUDER (1887) divides the family into the subfamilies *Ceratoisidinæ*, *Primnoisidinæ* (including *Mopseidæ*) and *Isidinæ*. In their Report on the Alcyonaria of the Challenger Expedition (1889) WRIGHT and STUDER substitute the name *Mopseinæ* for STUDER's subfamily *Primnoisidinæ*, and base the subfamilies of the *Isidæ* on the characters of the spicules.

The trouble with this arrangement is the intergrading features between the *Mopseinæ* and *Ceratoisidinæ*. In his discussion of the genera *Ceratoisis* and *Primnoisis*, which belong to the *Ceratoisidinæ* and *Mopseinæ* respectively, HICKSON (1907) holds that these genera are not distinct, and proposes including both in the genus *Ceratoisis*. He says:

"The study of many specimens belonging to this family has convinced me that this subdivision is unnecessary and inconvenient. The many variations of spicule characters that are found in the species of a single genus render these structures unsatisfactory for the purpose of wide systematic differentiation. If we take a single species from each of two of the subfamilies and compare them, the differences observed in the character and arrangement of the spicules may seem to be of a higher rank than the usual differences between genera; while, on the other hand the examination of a large number of species of the same two genera will reveal so many of the intermediate conditions as to render the separation of the genera, on spicule characters alone, impossible. This kind of difficulty is particularly well seen in the case of the genera *Ceratoisis* and *Primnoisis* which were placed by Professors WRIGHT and STUDER in the subfamilies *Ceratoisinæ* and *Mopseinæ*"[1].

This view is supported by an argument which should be read carefully by those interested in the discussion, but is too long to be quoted here. The present writer believes, however, that the family *Isidæ* was ably handled by WRIGHT and STUDER, and finds himself unable to agree with the eminent authority quoted above.

The intergradation of spicules is very wide spread among the Alcyonaria, and yet there are often certain dominant forms of spicules that are quite characteristic of definite groups, and therefore available for systematic purposes and form good zoological characters[2].

The spicules of the *Ceratoisidinæ* are of two general types. 1st. True spindles, either with verrucæ or comparatively plain or needle-like. These may be slightly forked or bifid at one end, but this does not alter their essential character. 2nd. Flattened spindles which are often bar-like with rounded ends, or with ends enlarged forming a lengthened hour-glass, or biscuit-form. These may approach the form of scales rather than of spindles. Even in such cases their edges are smooth, not ctenate nor with branched processes, although they may be beset with minute thorny points.

These spicules seem to me to be quite distinct from those found in the genus *Primnoisis*, which has the characteristic scales of the primnoid gorgonians, with branched processes or finely ctenate edges, often imbricating on the calyx walls.

This difference is strikingly shown in Plate IX of the Challenger Alcyonaria, where figures 1 to 5 represent spicules of *Acanella*, one of the *Ceratoisinæ*; and figures 6 to 11 all representing species of *Mopseinæ*. Or compare Plate Va, figures 1 to 9, all of *Ceratoisidinæ*, with Plate IX, figures 6 to 11, of spicules of *Mopseinæ*. It seems to the writer that it would be difficult to show greater contrasts than are found not only in these figures, but also in slides of spicules from specimens of *Ceratoisidinæ* on the one hand, and *Mopseinæ* on the other.

It is true that HICKSON's *Ceratoisis spicata* (loc. cit., p. 7) at first seems to form an intergrading link between these subfamilies; but it appears to me that this is more seeming than real. This writer describes the spicules, in part, as follows:

"The calyces are covered with an armature of overlapping scales, some of which are triradiate, others irregular in form".

According to this description and the figures none of these spicules show any real approach to the form of the characteristic spicules of *Ceratoisis*. Moreover the writer says:

"In the character of the axis it is closely related to *Primnoisis*".

The calyx spicules resemble closely some of the thorny scales of the primnoid genus *Caligorgia*, for instance.

The present writer, therefore, would place HICKSON's *Ceratoisis spicata* in the genus *Primnoisis*, calling it *Primnoisis spicata* (Hickson), and retain the subfamilies adopted by WRIGHT and STUDER, modifying, however, their subfamily diagnoses as follows:

Isidinæ: — Cœnenchyma thick; calyces inserted; spicules densely tuberculate spindles, oval radiate forms, heads, double heads, etc.

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[1] National Antarctic Expedition. Natural History, Vol. VII, Cœlentera Alcyonaria, 1907, p. 4.

[2] See the discussion of this point by the writer in his Report on the Muriceidæ of the Siboga Expedition, 1910, p. 5.

Ceratoisidinæ: — Cœnenchyma thin; calyces inserted, long, usually cylindrical; characteristic spicules in the form of spindles, or flattened bar-like of hour-glass forms which are smooth or with minute spiny points, never with true verrucæ; colony not profusely branched.

Mopseinæ: — Cœnenchyma thin; calyces usually exserted; often club-shaped; characteristic spicules flattened scales, often profusely branched or ctenate on their edges.

Systematic relationships of the family Isidæ.

The closest affinities of this family seem to be with the *Primnoidæ*, a fact which has been commented upon by several writers, the calcareous internodes of the former being apparently very similar in composition and structure to the calcareous axis of the latter. The cœnenchyma is usually thin in both families.

In the polyps and calyces of certain *Isidæ* we have a very striking similarity to those of the *Primnoidæ*, and this is particularly true in the case of the new genus *Peltastisis* described in this Report. Here the form of the calyx, the form and arrangement of the spicules, the reduction in the number of adaxial scales, and the essential character of the operculum (a scale to each segment) are all typically primnoid in their nature. Were it not for the jointed axis of *Peltastisis* I doubt if any one would hesitate in putting it in the family *Primnoidæ*.

Indeed the character of the axis alone can be successfully used in separating these two closely related families.

On the other hand, the *Isidæ* show many characters in common with the sclerogorgian family *Melitodidæ*. These families can not be separated on the characters of the spicules, for those of the *Isinæ* show the same general characters as are common in the *Melitodidæ*. The nodes and internodes are superficially much alike in the two families, and the calcareous internodes are in some cases, particularly in the older parts of the colony, apparently almost as completely calcareous and amorphous in the *Melitodidæ* as in the *Isidæ*. It was formerly held that both nodes and internodes of *Melitodidæ* were penetrated by solenia; but this is now denied[1]. Here, again, the characters of the axis seem to afford the only reliable means of family differentiation, the horny nodes of the *Melitodidæ* being always more or less mixed with calcareous spicules, while those of the *Isidæ* are purely horny, without spicules.

The writer desires to emphasize an opinion elsewhere expressed[2] as follows:

"Our knowledge of the lower invertebrates is still far too fragmentary to permit us to indulge the hope that our work as systematists will really serve to express in final form the actual relationships of any large group of animals.

While a natural classification is a 'consummation devoutly to be desired' we are not yet, it seems to me, in sight of it".

The main service of classification, in our present state of knowledge, is to facilitate identification of groups, the final result being facility in determination of species.

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[1] Bourne. A Treatise on Zoology, Part II, Chapter VI, p. 28, 1900.

[2] The Gorgonacea of the Siboga Expedition, III, The Muriceidæ, 1900, p. 9.

Key to the genera of the Isidæ.

(Generic names enclosed in brackets indicate that such genera are not represented in the Siboga collection).

Isidinæ:
- Spicules densely tuberculate spindles, calyces included. . . . . **Isis**

Ceratoisidinæ:
- Calyces not uniserial, and with a crown of points formed by large, needle-like spicules.
  - Colony simple; or, if branched, with branches springing from the calcareous internodes.
    - Calyx with an external layer of flattened, bar-like spicules with rounded ends . . . . **(Lepidisis)**
    - Calyx with spindles or needles only . . . . **Ceratoisis**
  - Colony branched, branches arising from horny nodes . . . . **Acanella**
- Calyces sometimes uniserial, without a crown of points.
  - Colony unbranched; calyces uniserial. . . . . **(Bathygorgia)**
  - Colony branched, branches from calcareous internodes.
    - Coenenchyma with spicules . . . . **(Callisis)**
    - Coenenchyma without spicules . . . . **(Sclerisis)**
  - Branches from horny nodes . . . . **(Isidella)**.

Mopseinæ:
- Calcareous internodes with serrated ridges. . . . . **(Acanthoisis)**
- Calcareous internodes without serrated ridges.
  - Calyces uniserial, with true opercula . . . . **Peltastisis**
  - Calyces not uniserial, no true opercula.
    - Spicules of calyx ctenate scales, or with thorny points . . . . **Mopsea**
    - Spicules of calyx spindles, with true verrucæ . . . . **(Chelidonisis)**[1]

Synoptic view of the genera and species of Isidæ secured by the Siboga.

* The asterisk (*) denotes a new species.

Isidinæ.

Isis.

I. hippuris, *I.* **reticulata*.

Ceratoisidinæ.

Ceratoisis.

C. paucispinosa, *C. philippinensis*, *C.* **wrighti*, *C. sp.?*

Acanella.

A. **sibogæ*, *A.* **weberi*, *A. sp.?*

Mopseinæ.

Mopsea.

M. **flava*, *M.* **alba*.

Peltastisis.

P. **uniserialis*, *P.* **cornuta*.

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[1] This form shows affinities with the *Isidinæ* in the form of its spicules, which are much like those of *Isis hippuris*; but has a rather thin cœnenchyma and evident calyces, characters which allie it with the *Mopseinæ*. See STUDER, Alcyonaires provenant des Campagnes de l'Hirondelle, 1901, p. 39 and Plate IV, fig. 9.

It will be seen from the table that of the thirteen species collected, three were previously known, two are represented by material insufficient for identification, and eight are described as new.

Systematic description of genera and species of Isidæ of the Siboga collection.

Isidinæ. (See the definition of this subfamily on p. 3).

Isis Linnæus.

Isis (in part) Linnæus. Hortus Cliffortianus, 1737, p. 479.
Isis (in part) Linnæus. Systema Naturæ, 1758, p. 1287.
Isis (in part) Pallas. Elenchus Zoophytorum, 1766, p. 220.
Isis (in part) Ellis and Solander. Natural History of Zoophytes, 1786, p. 104.
Isis (in part) Esper. Die Pflanzenthiere, Vol. I, 1791, p. 27.
Isis Lamouroux. Hist. Polypes coral. flexibles, 1816, p. 4687.
Isis Lamouroux. Exposition Méthodique, 1821, p. 39.
Isis Lamarck. Hist. Nat. Anim. sans Vert., 1836, p. 473.
Isis (in part) Milne Edwards et Haime. Hist. nat. des Coralliaires, Vol. I, 1857, p. 193.
Isis Gray. Proceedings Zool. Society of London, 1857.
Isis Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Isis Dana. Synopsis Report on Zoophytes of the Wilkes Expedition, 1859, p. 144.
Isis Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 46.
Isis Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XLV.
Isis Thomson and Simpson. Alcyonarians of the Indian Ocean, II, Alcyonarians of the Deep Sea, 1909, p. 180.

The original genus *Isis* included not only all of the present *Isidæ*, but also certain of the *Melitodidæ*, and resulted in the same confusion as in the synonymy of the family *Isidæ*. Lamouroux (1816) appears to have used the name in almost its modern signification; but subsequent writers included many other forms, until Gray (1857) restricted the genus. Kölliker (1865) was the first to carefully describe the spicules and use them in his generic definition, and subsequent writers have used the name as understood in the present work.

This being the only genus of the subfamily *Isidinæ*, the definition already given for the *Isidinæ* will serve for the genus.

The type species of this genus is *Isis hippuris* Linn., and the only other known species in the *Isis reticulata* described beyond.

1. *Isis hippuris* Linnæus. (Plate I, figs. 1, 1*a*, 1*b*; Plate V, fig. 1).

Isis hippuris (in part) Linnæus. Systema Naturæ, 12th Edition, p. 1287.
Isis hippuris (in part) Pallas. Elenchus Zoophytorum, 1766, p. 233.
Isis hippuris Ellis and Solander. Natural History of Zoophytes, 1786, p. 105.
Isis hippuris (in part) Esper. Die Pflanzenthiere, Vol. I, 1791, p. 279.
Isis hippuris Lamouroux. Histoire Polypiers coralligènes flexibles, 1816, p. 476.
Isis hippuris Lamouroux. Exposition Méthodique, 1821, p. 39.
Isis hippuris Lamarck. Histoire Naturelle des animaux sans vertèbres, 1836, p. 475.

Isis hippuris Milne Edwards et Haime. Histoire nat. des Coralliaires, Vol. I, 1857, p. 194.
Isis hippuris Steenstrup. Om slaegter og de under *Isis hippuris* Linn. sammenblendede Arten, 1848, p. 1.
Isis hippuris Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Isis hippuris Thomson and Simpson. Alcyonarians of the Indian Ocean, II, 1909, p. 180.

Stat. 71. Makassar and surroundings. Up to 32 meters. Mud, sand with mud, coral.
Stat. 133. Anchorage off Lirung, Salibabu-Island. Up to 36 meters. Mud and hard sand.
Stat. 142. Anchorage off Laiwui, coast of Obi Major. 23 meters. Very fine hard sand, mud.
Stat. 144. Anchorage North of Salomakiëe (Damar) Island. 45 meters. Coral bottom and Lithothamnion.
Stat. 149. Fau Anchorage and lagune. West coast of Gebé Island. 31 meters. Coral.
Stat. 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral.
Stat. 279. Rumah-Kuda Bay, Roma Island. 36 meters. Mud and sand.
Stat. 301. 10° 38′ S., 123° 25′.2 E. 22 meters. Mud, coral and Lithothamnion.
Stat. 303. Haingsisi, Samau Island. Up to 36 Meters. Lithothamnion.

Colony (incomplete) 28 cm. in height, growing in a densely aggregated mass of branches which are individually composed largely of tufts of branchlets. Main stem, or branch, round in section, about 1 cm. in diameter. The main branches are lateral in position, often flattened proximally in the plane of ramification. The secondary branches are usually lateral in position and often bear terminal twigs which are swollen, round and pointed at the ends.

The cœnenchyma is very thick and fleshy, and does not show any external evidence, in alcoholic specimens, of the jointed axis. The calyces are entirely included, and are distributed on all sides of the stem and branches, much as in the *Plexauridæ*. Their openings are almost completely concealed, appearing only as minute depressions in the general surface of the branches, the openings being no larger than pin holes. In color and appearance the colony greatly resembles a profusely branching *Millepora*, the fine pits closely resembling the gastropores of the latter. The polyps are very minute and entirely retracted, so that little of their structure could be ascertained without sectioning. The surface is quite smooth, the spicules not being evident on account of their small size.

A cross section of a branch reveals a very thick cœnenchyma in which the relatively small calyces are embedded. The cœnenchyma is filled with a dense mass of small spicules. Around the axis is a series of very large watervascular canals, their number being very often eight in the smaller branches. The axis is composed of alternate horny and calcareous joints, the latter being the longer and larger, being 1 cm. in diameter in the specimen described. Their length is about 1 cm., and this does not vary greatly even in the distal branchlets.

These calcareous internodes are strongly fluted longitudinally, the grooves being the impressions of the primary watervascular canals. The horny nodes are much shorter, not exceeding 3 mm. in the specimen described, and having a diameter of 5 mm. where the adjacent calcareous joints are 1 cm. long. The branches usually arise from the calcareous nodes, but bifurcations usually take place upon the distal ends of horny joints.

A cross section of a calcareous internode about 5 mm. in diameter shows a central amorphous area surrounded by a darker line, like a line of growth, enclosing a figure with eight concave sides, beyond this, at varying distances, are other similar lines enclosing figures of more than eight concave sides, the outer lines being closer together than the others. While the calcareous substance of the axis shows a crystalline appearance, there are no indications that it is composed of fused spicules. The concave sides of the cross section correspond, of course to the grooves for the primary canals, and the number eight seems significant as being the original number of these canals, corresponding to the eight intermesenterial chambers of the primary polyp of the colony or branch. The central area is marked by an axial nuclear spot, from which many lines radiate toward the periphery of the area

The horny nodes are hour-glass shaped, in longitudinal section, their ends being concave for the insertion of the convex ends of the calcareous internodes. At the line of juncture there is an irregular mass of horny projections alternating with the calcareous material, giving an anchorage that binds the node and internode together. There are no calcareous spicules in the nodes.

Spicules. These are all quite small, and of several forms. All are modifications of short tuberculate spindles. Double spindles, dumb-bell shapes, double heads, crosses and densely tuberculate oval forms predominate. All are closely tuberculate, and most of them show a median, constricted smooth girdle. There are a few double crosses and spindles with regular whorls of tubercles.

Color. The specimens in alcohol are a tan brown, the dried specimens being darker brown. Axis white, with the horny nodes dark horn brown.

General distribution. This species has been reported from the Indian Ocean, and parts of the tropical eastern Pacific. The form reported from the Mediterranean is in all probability not this species or genus.

This species is quite variable, and specimens differ much according to size and age, the larger stems and branches having the "moniliform" appearance that has led some authors to describe several species on the basis of what appears to be merely varietal differences.

Many of the dried specimens were originally much larger than the one described; but, owing to their excessive brittleness, they are so badly broken up that the original dimensions can not easily be ascertained.

2. *Isis reticulata* new species. (Plate I, figs. 2, 2*a*; Plate V, fig. 2).

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells.

Colony much broken up, the specimens consisting of large and small fragments all from the same station. General habit loose and straggling, much less inclined to the formation of dense tufts than in *Isis hippuris*. The thickest stem found is 7 mm. in diameter, and the horny internodes are almost entirely obliterated, being indicated by darker color alone. The longitudinal grooves are continuous over the calcareous and horny joints, the latter being but slightly constricted. The first calcareous internode is 1 cm. long, the next 1.6 cm., the next 2 cm., and bearing a branch a little above its middle. Further up the horny nodes are sharply constricted, clearly defined and about 2 mm. in length. The branching is straggling, and there are occasional anastomoses of branches. There is a distinct tendency toward a flabellate form of colony. The distal branches are much longer and more slender than in *Isis hippuris*, sometimes attaining a length of as much as 17 cm., while their diameter is only 2 mm. The terminal twigs are not swollen at the ends, in marked contrast to *I. hippuris*.

The calyces are entirely included, very small, and sparsely and irregularly distributed on all sides of the branches. The polyps are partially expanded in the specimen described, making it difficult to ascertain the form and size of the apertures. Where the polyps are fully retracted the surface of the branch is perfectly smooth, with little or no indication of the calyx openings. The polyps themselves are small and appear to be devoid of spicules, both in body walls and tentacles. Consequently they are very soft and flabby, and are usually prone against the cœnenchyma of the branches when expanded in alcoholic specimens.

Spicules. The spicules are minute, smaller than in *Isis hippuris*, and distinctly different in shape, being much more delicate spindles with tubercles often symmetrically disposed around the main axis. Irregular branched forms are common. Crosses are more rarely seen, and also a few curved spindles with large tubercles. A comparison of a slide of spindles from *I. reticulata* with one from *I. hippuris* shows a very distinct difference in the assemblage of forms of the two species.

Color. The entire colony, in alcohol, is reddish brown. The polyps are more distinctly reddish than the cœnenchyma, sometimes approaching a maroon.

The species seems quite distinct from *Isis hippuris*, from which it differs in manner of branching, reticulation, slenderness of twigs, color, and most of all in the character of the spicules.

Ceratoisidinæ. (For definition of subfamily see p. 4).

Ceratoisis Wright.

Keratoisis E. Percival Wright. Annals and Magazine of Natural History, 4th Series, Vol. II, 1868, p. 427. (Name only).
Keratoisis E. Percival Wright. Annals and Magazine of Natural History, 4th Series, Vol. III, 1869, p. 23.
Keratoisis Gray. Catalogue of Lithophytes in the British Museum, 1870, p. 18.
Keratoisis Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 662.
Ceratoisis Verrill. Bulletin Museum of Comparative Zoology, Vol. XI, 1883, p. 10.
Ceratoists Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 26.
Ceratoisis (in part) Hickson. National Antarctic Expedition. Natural History, Vol. III, Cœlentera Alcyonaria, 1907, p. 5.
Ceratoisis Nutting. Hawaiian Alcyonaria, 1908, p. 570.

The original description of this genus is as follows:

"Coral branched, irregularly furcate; axis jointed, composed of horny and calcareous portions; the latter are hollow, smooth, varying considerably in length, and maintaining their form after maceration in caustic alkalies; the branches are given off from the calcareous portions. The so-called "barky layer" (cœnenchyma) is well developed, and contains a large number of calcareous spicules. The polyps are irregularly and somewhat densely grouped all around the axis; they are of large size and are completely covered with spicules, which are closely packed side by side. A variable number (nine to eleven) of long fusiform spicules surround the apical portion of the polype, forming a calyx. Tentacles eight, pinnately lobed".

Verrill includes in this genus all of his family "*Ceratoisidæ*" that have the cœnenchyma and calyces filled with large fusiform spicules and the calyx armed with a crown of spines. This definition is somewhat misleading, as the small spicules often found in the calyces and cœnenchyma are often not fusiform but lenticular or "biscuit-shaped", sometimes fiddle-shaped, or even oval.

Studer (1887) practically adopts the original definition of Wright. Wright and Studer (1889) point out the difficulty of distinguishing between the unbranched species of *Lepidisis* (Verrill) and the unbranched forms of *Ceratoisis*. This point seems to the present writer to be well taken, and should result in the combination of the two genera, as suggested by Wright and Studer.

Their definition of the genus *Ceratoisis* is as follows:

"The colony is simple or branched, in the latter case with the branches arising from the calcareous internodes. These latter are long and hollow when young. The cœnenchyma contains long smooth spindles or needle-like spicules. In the polyps, which are nonretractile, there are large needles. One row of these spicules is so disposed that one lies at the base between each pair of tentacles and projects beyond them, the result being a circlet of diverging spines around the oral region".

This definition is dificient in the fact that it makes no mention of the oblong, comparatively smooth, oval, or lenticular spicules found both in *Ceratoisis grayi* (the type species) and in the species of Verrill's genus *Lepidisis*. This point, however, is covered in their more elaborate definition of the genus on page 26 of the Challenger Report, Alcyonaria, 1889.

The genus *Ceratoisis*, as used in the present work, may be defined as follows:

Ceratoisidinæ whose calyces are armed with a crown of needle-like spicules. The axis is simple or sparingly branched, the calcareous internodes hollow, at least in the younger portions of the colony. Cœnenchyma, and often the calyces, with oblong, lenticular, fiddle-shaped, or oval scales with comparatively smooth surfaces.

The type species of this genus is *Ceratoisis grayi* Wright. Other species are *C. (Lepidisis) caryophyllia* (Verrill), *C. flabellum* Nutting, *C. gracilis* Thomson and Henderson, *C. grandiflora* Studer, *C. grandis* Nutting, *C. (Lepidisis) inermis* (Studer). *C. japonica* Studer, *C. (Lepidisis) longiflora* (Verrill), *C. nuda* Wright and Studer, *C. ornata* Verrill, *C. palmæ* Wright and Studer, *C. philippinensis* Wright and Studer, *C. ramosa* Hickson, *C. siemenensis* Studer, *C. (Lepidisis) vitrea* (Verrill), and the new species described in the present work.

1. *Ceratoisis paucispinosa* Wright and Studer.

Ceratoisis paucispinosa Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 28.

Stat. 52. 9° 3'.4 S., 119° 56'.7 E. 959 meters. Globigerina ooze.

Specimens consisting of two fragments, probably from the same stem. The largest of these includes the base of the colony consisting of large thin, plate-like calcareous lobes, but one of which is complete. This is 2.6 cm. long. The fragment has an entire length of 26 cm. The first internode above the base is the shortest, being 3.5 mm. long. The next is 1.7 cm., the next 3.1 cm. the next 4.3 cm., the next 4.5 cm., and the remaining three gradually diminish in size. The diameter at base is 3 mm., at distal end 1.5 mm. The longest horny node is the third, which is 3 mm. long, and their length diminishes to the distal node which is 1.4 mm. The surfaces of the internodes are marked by shallow longitudinal furrows. The other fragment is nearly 18 cm. long, much more slender than the first, and the length of the internodes varies from 1 cm. to 2.9 cm. The specimens are so mutilated that the arrangement of the calyces can not be determined, further than that they appear to be borne on all sides of the stem.

The individual calyces are excessively long and slender. It is possible that the specimen has been dried at some time, and that the polyps have been shrivelled so as to be more slender than they were originally. A typical calyx is 8 mm. long to the top of the marginal spines, 2.2 mm. in diameter at margin, and 1.1 mm. at the narrowest part of the pedicel, near the middle. There are a few slender, needle-like spicules on the proximal part of the calyx, especially on the abaxial side, and a series of 8 very long, sharp smooth spindles with their points projecting far beyond the margin, forming a crown of points. There are a few needle-like spindles in the cœnenchyma near the polyp bases. Otherwise the cœnenchyma is rather leathery and almost devoid of large spindles. But there are numerous comparatively minute bar-like spicules near the surface of the cœnenchyma, and a few minute spicules in the tentacles.

Spicules. These are long sharp needles, and small bar-like forms. The former sometimes attain a length of 5 mm., and are usually sharp at both ends. Their surface is studded with numerous small sharp thorn-like points. The largest of these needles form the marginal crown of points. The bar-like forms in the cœnenchyma are minute, rather short bars, with their ends somewhat expanded and rounded.

Color. The colony is ivory white (in alcohol), and the polyps are very light brown.

General distribution. The type locality is off the Hyalonema Grounds, Japan, 343 fathoms.

A comparison with polyps of the Challenger type shows that the Siboga specimens have nore slender calyces, due probably to drying. The original description says that the cœnenchyma is without spicules. These are minute, and might escape observation.

2. *Ceratoisis philippinensis* Wright and Studer.

Ceratoisis philippinensis Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 27.

Stat.	52.	9° 3'.4 S.,	119° 56'.7 E.	959 meters.	Globigerina ooze.
Stat.	122.	1° 58'.5 N.,	125° 0'.5 E.	1264—1165 meters.	Stone.
? Stat.	173.	3° 27' S.,	131° 0'.5 E.	567 meters.	Fine yellow grey mud.
? Stat.	178.	2° 40' S.,	128° 37'.5 E.	835 meters.	Blue mud.

Specimens consisting of two unbranched fragments, the longest being 13.6 cm. in length.

The longest calcareous internode is 6.1 cm. long, while the horny nodes are but 1 mm. long. The shorter fragment has a thicker axis than the other, their diameters being 2 mm. and 1.8 mm. respectively. Both are largely denuded of cœnenchyma, but retain this and the polyps in places. The calyces are rather closely set in irregular spirals, being on all sides of the stem or branch.

The individual calyces are columnar in shape and usually project at a wide angle from the stem. A typical one is 4.5 mm. in height and 2.5 mm. in diameter. The walls are nearly straight. There are a few transversely disposed spindles near the base, and a row of about eight long spindles extending perpendicularly from the transverse spicules to beyond the margin, around which they form a crown of points. Shorter spindles support the larger ones near the base, as if propping them. The dorsal surfaces of the tentacles are armed with two or three rows of bar-like spicules longitudinally disposed.

The cœnenchyma of the stem is thin and stripped from most of the specimens. It contains a few spicules in the form of spindles.

Spicules. These are nearly all slender spindles, pointed at the ends and attaining a length of 3. mm. They differ from the others described in having their surfaces almost perfectly smooth, without verrucæ or projecting points of any kind, thus resembling most of the spicules of the pennatulids. The largest of these spicules are those forming the crown of points around the calyx margins. Besides these spindles, there are a few bar-like forms with rounded ends, found in the tentacles.

Color. The specimens are ivory white, in alcohol. The nodes are dark brown, and the polyps very light brown.

General distribution. The type locality is Challenger Station 201, off the Philippines; depth 82 fathoms; bottom, stones.

This species is also found in the Japanese waters. (Nutting, Mss.).

The specimen described is labeled "*Ceratoisis philippinensis*". This was very likely written by Dr. Versluys during his preliminary studies of the *Gorgonacea* of the Siboga Expedition. Through his kindness the writer has been permitted to examine fragments of the Challenger types of this species. These agree fairly well with the above description; but differ considerably from the description in the Challenger Report, having calyces in some instances 5 mm. in height, and with the spiculation as described above. The small spicules are more numerous than in the Siboga material, and the color of the calyces is much darker. The calcareous internodes are longer in the Siboga material than the descriptions of the type would indicate.

3. *Ceratoisis wrighti* new species[1]. (Plate II, figs. 1, 1*a*; Plate V, fig. 3).

Stat. 87. 0° 32′ S., 119° 39′.8 E. 655 meters. Fine grey mud.

Colony over 1 meter in length (113 cm.), unbranched. The base consists of two very long, expanded, lobular limestone processes, extending laterally from the bottom of the stem. One of these processes is nearly 5.6 cm. in length, and 5 mm. wide at its broadest point. The greatest diameter of the axis, near base, is 3.3 mm. The shortest (basal) internode is 3.5 mm. long, and the longest (4th from base) 3.3 cm. The horny nodes are short, and the longest (basal) one is 3 mm. in length. Average length about 1 mm. The polyps are biserially arranged, in general, although this is occasionally interfered with by one situated on the front or back of the colony. They all curve upward toward the distal end of the colony, with their adaxial sides almost contiguous with the cœnenchyma of the stem; the summit of one reaching to, or slightly beyond, the base of the one next above.

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[1] Named in honor of E. Percival Wright who first defined the genus *Ceratoisis*.

The individual calyx is columnar or cylindrical in form, but many are swollen with ova in their proximal portion. A typical one is 6 mm. in height to the end of the crown of points, and 2.5 mm. broad at the slightly expanded margin. There is usually one conspicuous, needle-like spicule placed vertically in the abaxial side of the calyx, reaching nearly from the base to the summit, but ordinarily not projecting beyond the margin, and attaining a length of 5 mm. There are also eight vertical spicules in the distal part of the calyx wall, whose points form a conspicuous crown, as in *C. paucispinosa*. Aside from these there are very few if any spicules in the calyx walls. Spicules appear to be wanting both in the tentacles and the general cœnenchyma of the stem, which is quite thick and fleshy.

Spicules. I find but the one kind, the slender, needle-like form described above as occurring in the calyx walls. Their surface is covered with regular, but rather sparsely disposed, minute, thorny points.

Color. The colony, when the cœnenchyma and the calyces have not been stripped from the stem, is a rather bright reddish brown. The axis is pure white, except at the nodes, which are dark brown.

This fine species differs from *C. paucispinosa*, its nearest ally, in length of calcareous internodes, size and disposition of polyps, and in the spiculation, being without spicules in the tentacles and cœnenchyma. It differs from *C. nuda* Wright and Studer in size of spicules, and in having no tentacular spicules, as well as in size of internodes.

4. *Ceratoisis sp.*?

Stat. 122. 1°58′.5 N., 125°0′.5 E. Between Menado and Biaru Island. 1264—1165 m. Stony bottom.

A fragment of denuded axis from Station 122 differs from all the other species in the collection in the length of the single calcareous internode which is 9.9 cm. long and has a diameter of 2.5 mm. The surface is regularly but not deeply furrowed or fluted longitudinally. The horny node is 23 mm. long.

The axis approaches the characters of *Ceratoisis grandis* Nutting from Hawaiian waters[1], which has internodes up to 14 cm. in length. The writer, however, does not feel justified in identifying species on the characters of the axis alone.

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[1] Proceedings of the U. S. National Museum, Vol. XXXIV, p. 570, 1908.

Acanella Gray (emended by Verrill).

Acanella Gray. Catalogue Lithophytes in British Museum, 1870, p. 16.
Acanella Verrill. Bulletin Museum of Comparative Zoology, Vol. XI, N⁰ 1, 1883, p. 13.
Acanella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 44.
Acanella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 29.
Acanella Nutting. Hawaiian Alcyonaria, 1908, p. 572.

VERRILL's definition of the genus is as follows:

"Coral either simple or variously branched. Axis with long calcareous joints and very short horny ones. The branches, where they exist, arise from the horny joints, either singly, or two or more together, often forming a whorl. Cœnenchyma very thin, containing, more or less abundantly, elongated fusiform spicula, usually of large size. Calicles large, elongated, composed of large fusiform spicula, often obliquely arranged; the margin is armed by eight long, spine-like, projecting acute spicula. Tentacles stiffened by abundant spicula. Base, in most cases, divided into large, flat, palmate lobes, which descend into the mud and serve as supporting roots or anchors".

STUDER (1887) gives a condensed definition, retaining the essential points as given by VERRILL.

WRIGHT and STUDER (1889) retain the definition of VERRILL, somewhat condensed, with the additional point that the basal internodes are much shorter than the distal. For the purposes of this work the following definition is offered for the genus *Acanella*:

Ceratoisidinæ, simple or branched, with branches arising from the horny nodes, often in whorls. Calyces prominent, with a crown of marginal points. Tentacles with minute spicules. Cœnenchyma thin, with fusiform spicules. All spicules have thorny points, but are without true verrucæ.

The type species of this genus is *Acanella arbuscula* (Johnston). Other known species are *Acanella eburnea* (Pourtalès), *A. chiliensis* Thomson and Henderson, *A. gregorii* Gray, *A. normani* Verrill, *A. rigida* Wright and Studer, *A. robusta* Thomson and Henderson, *A. simplex* Verrill, *A. spiculosa* Verrill and the additional species about to be described.

1. *Acanella sibogæ* new species. (Plate III, figs. 2, 2*a*; Plate V, fig. 4).

Stat.	85.	0° 36'.5 S.,	119° 29'.5 E.	724 meters.	Fine grey mud.
Stat.	170.	3° 37'.7 S.,	131° 26'.4 E.	924 meters.	Fine grey mud.
Stat.	178.	2° 40' S.,	128° 37'.5 E.	835 meters.	Blue mud.
Stat.	211.	5° 40'.3 S.,	120° 45'.5 E.	1158 meters.	Coarse grey mud.
Stat.	241.	4° 24'.3 S.,	129° 49'.3 E.	1570 meters.	Dark sand with small stones.

Type specimen fragmentary, 7.3 cm. long, the proximal part missing. The largest fragment consists of a central straight shaft from which spring four pairs or opposite branches. In two cases there is a third branch origin between the bases of the opposite pairs, showing a tendency toward the formation of verticels so common in this genus, the verticels being 1.4 cm. apart and springing from the horny internodes, which are so narrow that they constitute mere bands.

The branchlets are curved, each consisting of a single calcareous internode varying from 1.3 to 1.8 cm. in length. The calyces are arranged in loose irregular spirals, the distance between their bases being usually from 2 to 4 mm. They are more closely approximated on the distal than on the proximal portions of the branchlets.

The individual calyces are columnar in some cases and obconical in others. A typical calyx is 4 mm. in height, with an average diameter of 1.6 mm., the body being somewhat expanded below. Another is much constricted below, and is 5. mm. in height and 1.7 mm. in diameter at the middle. The columnar form, however, is by far the more common. The calyces project at right angles from the branch, but bend somewhat upward, or distally. Their walls are filled with curved spindles arranged horizontally in the basal parts and obliquely in the distal parts of the walls, those on the abaxial side being larger than those on the adaxial side of the polyp, and extend from the abaxial mid-line upward and obliquely around the calyx walls, somewhat resembling a reversed chevron. The adaxial side is filled with smaller spicules disposed horizontally, in the main.

There is usually a crown of eight well-marked points around the margin, each point consisting of the distal end of a single spicule. The tentacles bear numerous stout, bar-like forms, without any very definite arrangement.

Spicules. These sometimes attain a length of nearly 3 mm., are much more uniform in size than in the other species in the collection, and are much more regularly placed, when in situ, except in case of the tentacular spicules.

Color. The colony, in alcohol, is ivory white, with light, almost white, polyps.

A direct comparison of the Siboga material of this species with a portion of the Challenger type of *A. rigida*, used by Dr. VERSLUYS in his studies, shows that while the two agree well in form of calyces and maximum size of spicules, they differ in comparative uniformity in size of spicules in the calyx walls. The walls of *A. rigida* contain a few comparatively large spicules on the abaxial side, interspersed with others much smaller. In *A. sibogæ* the abaxial wall is filled with a compact series of more slender spindles of comparatively uniform size, without a noticeable admixture of large and small. *A. sibogæ* differs from *A. normani* in the robustness of the calyces and spicules, and from *A. arbuscula* in the same points as from *A. normani*. Indeed, these two latter may be identical.

The present species differs from the next (*A. weberi*) in having much stouter calyces, which are directed outward, and by its marginal crown of points.

2. *Acanella weberi* new species. (Plate III, figs. 1, 1*a*; Plate V, fig. 6).

Stat. 74. 5° 3'.5 S., 119° 0' E. 450 meters. Globigerina ooze.

Colony arborescent, 18.5 cm. in height. Root consisting of three (originally four) calcareous cylindrical projections pointing downward and outward, all incomplete. Main stem 2.2 cm. long, breaking up into a whorl of branches at its distal end, there being 5 branches in the whorl, with a 6th slender one in the centre. These branches send off one or two pairs of usually opposite branchlets, the first pair being from 8 to 10 mm. from the bases, the second pair being 9 to 10 mm. above the first. Above these pairs an occasional lateral branchlet is produced, especially toward the distal ends of the branches. Some of the branchlets, however, are simple throughout their length of as much as 12 cm. The branches arise from horny nodes. The calcareous internodes vary in length from the second, which is 3 mm. long, to a length of 14 mm. on the terminal branchlets. The horny nodes vary from the basal one of 2 mm. to about .2 mm. on the terminal twigs.

The diameter of the main stem near the base is 2.5 mm., decreasing to a thread-like axis on distal branchlets. The calyces tend to a biserial arrangement on the branches, but are much more thickly emplanted on distal parts. On the tip of one branch they are thickly emplanted over the surface of an oval object which is probably a parasitic barnacle. The branches are erect, forming a symmetrical and graceful colony.

The individual calyces are club-shaped, and inclined toward the distal end of the colony, sometimes with the adaxial wall contiguous with the branch throughout.

Their adaxial side measures about 2 mm. in length, and their abaxial about 3 mm. Diameter at margin 1.1 mm., at base about .8 mm. The calyx walls are filled with large and small spindles, many of them spirally arranged and more or less bent or wavy. Some of them attain a length of 2.1 mm., or even 3 mm., extending the whole length of the calyx from base to summit. These larger spicules are usually placed on the abaxial wall of the calyx, and sometimes they occur in two series forming a sort of rude inverted chevron on the abaxial wall. There are a few similar but smaller spindles arranged vertically on the adaxial side. While the points of the spindles often extend beyond the margin, they do not form a regular series of eight marginal points such as is found in many other *Isidæ*.

The tentacles are armed with numerous bar-like spicules irregularly placed, but most often transversely disposed.

The cœnenchyma is thin, and contains a few of the large spindles longitudinally disposed, and more numerous small, bar-like forms.

Spicules. These have already been described. Their maximum length, 3 mm., agrees with Verrill's description of *A. normani* [1], but the manner of branching seems quite distinct. The surfaces of the spicules are covered with fine conical points, evenly distributed.

Color. The colony is white, in alcohol, with the polyps a very light golden brown. The horny nodes of the axis are dark golden brown.

This species is doubtless nearest *A. normani* Verrill; but a direct comparison of the Siboga material with a specimen identified by Verrill as *A. normani* shows that *A. weberi* differs from *A. normani* in the shape of the calyces, which are much longer and more slender in *A. normani*; and in the spicules, which are much more slender and form a regular crown of points in *A. normani*.

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[1] Bulletin of Museum of Comparative Zoology, XI, N° 1, p. 17.

3. *Acanella* sp.?

Stat. 45. 7° 24′ S., 118° 15′.2 E. 794 meters. Fine grey mud.

The specimen consists of a fragment comprising three calcareous internodes joined at their bottom to a horny internode which supports the three. The longest of these internodes is 1.8 cm. long, and the others are nearly as long. Diameter 1.2 mm. The surface is longitudinally grooved or fluted.

This specimen may possibly be *Acanella chilensis*[1] which has the branches arranged in irregular whorls of two or three.

Mopseinæ. (See definition on page 4).

Mopsea Lamouroux.

Mopsea Lamouroux. Histoire des Polypiers coralligènes flexibles, 1816, p. 465.
Mopsea (in part) Ehrenberg. Corallenthiere des Rothen Meeres, 1834, p. 131.
Mopsea Gray. Proceedings Zoological Society of London, 1857, p. 283.
Mopsea Milne Edwards et Haime. Histoire naturelle des Coralliaires, Vol. I, 1857, p. 197.
Mopsea (in part) Dana. Synopsis of the Report on Zoophytes, Wilkes Expedition, 1859, p. 144.
Mopsea Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 665.
Mopsea Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 46.
Mopsea Wright and Studer. Challenger Reports, the Alcyonaria, 1889, pp. XLV, 40.

The original definition for this genus (LAMOUROUX 1816) is as follows:

"Polypier dendroide à rameaux pinnés: écorce mince, adhérente, couverte de mamelons très petits, elongés, recourbés du côté de la tige, épars ou subverticellés".

Subsequent writers modified this definition so as to admit certain species of *Melithæidæ*, until STUDER (1887) defined it as follows:

"Colonie in einer Ebene verzweigt, Polypen klein, keulenförmig, in dichten Spiralen ringsum den Stamm angeordnet. Kelchschuppen klein, niedrig und stachlig".

WRIGHT and STUDER (1889) expanded this definition to considerable length on page 40, but give a much shorter definition on page XLV which is practically the same as the one by STUDER, quoted above.

"The colony is branched and expanded fan-like in one plane. The polyps are small, club-like in form, and arranged in dense spirals around the stem. The calyx scales are small, short and spiny".

The above definition is the one adopted in this work.

The type species of this genus is *Mopsea encrinula* (Lamarck). Other known species are *M. dichotoma* (Linn.), and the two new species about to be described.

1. *Mopsea flava* new species. (Plate IV, figs. 1, 1*a*; Plate V, fig. 5).

Staf. 117. 1° 0′.5 N., 122° 56′ E. 80 meters. Sand and coral.

Colony strictly flabellate in form, 26 cm. in height, and 17 cm. broad. 3.6 cm. above its base the main stem sends off two opposite branches each bearing branchlets which themselves bear lateral twigs irregularly spaced. Branches of the 4th order are sometimes produced. The main stem, after giving off these branches, continues upward in a wavy course giving off a few lateral branches and ultimate twigs to its distal end. These laterals are very unevenly spaced, but average about 5 mm. apart. Diameter of main stem 5.5 mm., of the lateral twigs 2 mm. The stem and main branches have even surfaces, there being no swellings nor constrictions at the nodes. Proximally the horny nodes are longer than the calcareous internodes, the former being 2.7 mm. long, and the latter 2 mm. Above the origins of the branches, however, the internodes are the longer, being 5.5 mm. long, while the nodes are but 2.2 mm. long. Both nodes and internodes are rather deeply grooved in the main stem, the grooves being numerous and parallel. The branches spring from the calcareous internodes. The polyps are small, and are emplanted on all sides of the larger branches, but tend to be lateral on the smaller twigs. Sometimes, however, they are on all sides, even to the tips of the ultimate branchlets.

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[1] Challenger Report, the Alcyonaria, 1889, p. 31.

The specimen is so completely covered with a parasitic sponge with small needle-like spicules that the details of the individual calyces are hard to ascertain. The calyces are small, and shaped like a truncated cone; or else are dome-shaped verrucæ. A typical one measures 1.3 mm. in height and 1.1 mm. in diameter. The calyx walls are covered with a mosaic of scale-like spicules with ctenate edges nicely fitted together and without regular arrangement in either vertical or transverse rows. The polyp is completely retractile. There are a few very small scales or calcareous granules on the dorsal surface of the tentacles.

Spicules. These are all small, oval or irregular scales, which are densely covered with relatively large tubercles. Occasionally they are somewhat branched, but not extensively so, and the branches are short. Occasionally, also, double heads are seen, and very rarely collar-button forms such as are found in the muriceid genus *Bebryce*. Cœnenchyma covered with similar scales.

Color. The entire colony is a light straw yellow in color, probably brighter yellow in life.

2. *Mopsea alba* new species. (Plate IV, figs. 2, 2*a*; Plate VI, fig. 4).

Stat. 156. 0° 29'.2 S., 130° 5'.3 E. 469 meters. Coarse sand and broken shells.

Colony flabellate in form, attaining a height of 15 mm., and a spread of 20 mm. The main stem arises from a disk-like base and contains one short, unbranched internode 1.2 mm. in length. The other internodes bear branches, except the distal one which is very slender and short. These internodes are 3.5 mm., 8 mm., and 2.9 mm. long, going from the 2nd to the 4th and last. The second internode bears two side branches and the third three. These main branches are rudely alternate and curved upward like candalabra. The lower one bears three curved branchlets, and the third, one. All of the branches arise from calcareous internodes.

The axis is rather faintly grooved, and seems to be hollow; but the specimen was too small to justify dissection to ascertain this point. The polyps are biserial, alternate, and rather distant, being almost 2 mm. apart.

The individual calyces are club-shaped, directed outward basally, and curving upward, or towards the branch termination, distally. A typical one measures 1.6 mm. in height and 1 mm.

across the margin. The calyx walls are covered with numerous small scales transversely disposed, but in numerous rows both vertical and transverse. These scales are very short and broad with their upper exposed edges finely ctenate and apparently overlapping the base of the next scale above. The number of scales in a horizontal row is hard to determine owing to their small size, but there seems to be as many as 20 or more in each row. The tentacles are covered with similar rows of narrow scales fitting the dorsal surface and looking like continuations of the rows on the calyx walls.

Spicules. These are narrow scales with curved and ctenate borders. On the basal parts of the calyces and in the cœnenchyma of the stem and branches they become so narrow as to assume the form of spindless with tuberculate or echinulate surfaces.

Color. The color is almost pure white, in alcohol.

Peltastisis new genus.

(*πελταστής* and *ισις*).

Colony unbranched; polyps uniserial and provided with true opercula consisting of eight parts or flaps, each part consisting of a single triangular scale; calyces with spicules of the primnoid type, being flattened scales with irregular branched or ctenate edges and with thorny points on the surface.

The type of this genus is *Peltastisis uniserialis* Nutting. The only other known species, also found in the Siboga collection, is described beyond.

These two species undoubtedly belong to the family *Isidæ*, and can, without violence, be admitted into the subfamily *Mopseinæ*. They are so different, however, from any previously known members of this group that it becomes necessary to construct a new genus for their reception.

The genus *Peltastisis* bridges the narrow gulf between the *Isidæ* and *Primnoidæ* in one important particular in that it combines the jointed axis of the former and the characteristic operculum of the latter, which it also resembles closely in its spiculation. Indeed, it is so directly intermediate between the two families that it can only arbitrarily be placed in either. The character of the axis is, however, of sufficient importance in the opinion of the writer to determine the position of *Peltastisis* as a member of the family *Isidæ*.

1. *Peltastisis uniserialis* new species. (Plate IV, figs. 3, 3*a*; Plate VI, fig. 3).

Stat. 145. 0° 54′ S., 128° 39′.9 E. 827 meters. Hard. Pumice stone.
Stat. 159. 0° 59′.1 S., 129° 48′.8 E. 411 meters. Coarse sand.

Colony consisting of a very delicate unbranched stem growing from a calcareous, lobulated flattened base and attaining a length of 6.2 cm. The basal 1.1 cm. of the stem is devoid of polyps. The basal internode measures 2 mm., the second 2.9 mm., the third and succeeding ones about 3 mm. The horny nodes are very short, about .5 mm., and much narrower than the calcareous ones. The polyps are uniserial and about 1.7 mm. apart, from summit to summit.

The individual calyces are club-shaped or conical, 1 mm. in height on their abaxial side, inclined toward the branch so that the adaxial side is almost contiguous with it. The margin is even, without evident crown of thorns or other conspicuous ornamentation. The calyx walls are armed with regular imbricating series of oval scale-like plates with ctenate edges and surfaces thickly emplanted with rounded points. There are about seven of these plates on each abaxial row, and two or three on the adaxial rows. Towards the base of the calyx these plates are narrowed and resemble transversely placed spindles. There is a strong operculum of the primnoid type, composed of eight flaps, each flap consisting of a single scale-like spicule. These opercular scales are covered with closely emplanted rounded points, and the entire operculum completely covers the infolded tentacles, there being no spaces between the individual segment or flaps.

Between each pair of adjacent polyps there is a swelling of the cœnenchyma of the branch or stem, the swellings alternating regularly with the polyps and containing ova. The cœnenchyma also contains a layer of rather heavy tuberculate spindles, arranged longitudinally.

Spicules. These are mainly of two types. 1st. the regular spicules of the cœnenchyma. These are spindles the surfaces of which are covered with rather sharp rounded point. 2nd. the scale-like spicules of the calyx walls, which are covered with similar points which, on the edges, give the appearance of a ctenate border. These two types of spicules intergrade on the basal parts of the calyces. The triangular scales forming the opercular segments constitute another, but much more infrequent type.

Color. The colony is almost white, in alcohol, the axis being pure white, and the calyces light brown.

While but a fragment of this very curious form was secured at Station 145, a number of specimens, apparently complete, were dredged from Station 159. The largest specimen was 8.5 cm. long. All are unbranched.

2. *Peltastisis cornuta* new species. (Plate IV, figs. 4, 4*a*; Plate VI, figs. 1, 2, 5).

Stat. 300. 10°48'.6 S., 123°23'.1 E. 918 meters. Fine grey mud.

The type consists of a small fragment, unbranched, 2.9 cm. long. The calcareous internodes vary from the proximal one which is 6.5 mm. long to the distal one which is 5.5 mm. long, decreasing regularly from proximal to distal ends of the specimen. The horny nodes are very short, less than .5 mm. They are more slender than the calcareous internodes, being about .5 mm. in diameter, while the latter are about .7 mm. The calyces are uniserial, quite regularly spaced, being about 2.5 mm. apart and three to each calcareous internode.

The individual calyces are short and thick, shaped like a short, curved club or horn, the distal end being inclined towards the stem or branch, as is characteristic of many of this family and of the *Primnoidæ*. The calyx is about 1 mm. in height (measured directly with dividers), and a little over 1. mm. in diameter across the margin.

The abaxial side of the calyx wall is supported by a most remarkable stay or brace consisting of a comparatively enormous spicule that is bent into a bow-shape so that its distal part is applied longitudinally to the curved abaxial contour of the calyx and its proximal portion is applied to the calcareous internode of the branch in such a manner as to curve downward and partly around it. This stay is therefore unsymmetrically placed as regards the branch, its proximal part passing around to the right of the midline of the polypiferous surface of the branch. The stay has a smooth surface except at the ends, where it bears numerous nodules, resembling that of the calcareous internodes, and showing ivory white against the darker color of the polyp. It gradually narrows to a point at the proximal end, but is broadened into a shape resembling a shoe-horn at the distal end, the concavity of the "shoe-horn" fitting the curve of the calyx margin to which it is applied. The stay is applied to the entire anterior face of the calyx, ending flush with the margin, and when it is removed it leaves a bare, impressed, band-like space on the abaxial wall, reaching from the base of the calyx to the marginal row of scales which, however, it does not invade. The stay is 1.5 mm. in length, measured with dividers, but would be much longer if measured around the curves.

The calyx walls are covered with minutely ctenate scales greatly resembling those found in several genera of *Primnoidæ*, e.g. *Plumarella* or *Caligorgia.* These scales are arranged in seven or eight vertical rows, except that there is but one scale (the marginal) to each of the adxaxial rows, and there are about eight scales to each abaxial row. The margin is even, without evident lobes, teeth or spines.

The operculum consists of eight segments, each segment consisting of a triangular scale-like spicule neatly fitted to the dorsal surface of a tentacle and with its surface covered with fine rounded nodules. At first view it looks as if each flap is made up of a fine mosaic of many minute plates; but, when separated from the tentacle, it is seen to be a single large thin plate or scale. The cœnenchyma of the branch is thin and contains a layer of longitudinally placed, thin, scale-like spicules which are spindle-shaped in profile, but much flattened. They are ornamented with small, very definite, rounded knobs or points thickly and rather evenly emplanted over the surface. Intermingled with these are clear bar-like and needle-like forms.

About midway between adjacent polyps and on the polypiferous face of the stem or branch are low rounded swellings which contain ova, as in the last species. This is a very exceptional arrangement among the Gorgonacea.

The axis is quite smooth, hard and white. The specimen was so small that it seemed inadvisable to dissect it to determine whether it is hollow or not. A small fragment of a twig termination shows that the axis does not extend to the end of the branch or stem, although this terminal part bears polyps and the strange bracket-like supports for the calyces apparently as well developed as on the proximal parts.

Spicules. These have been already described, and are of several kinds. 1st. The small ctenate scales of the calyx walls. 2nd. The flattened, scale-like spindles of the cœnenchyma. 3rd. The large, thin, triangular plates of the operculum. 4th. The occasional bar-like or rod-like forms in the cœnenchyma, and 5th. The remarkable curved stays or supports on the abaxial faces of the calyces.

Color. The fragment is almost white, with the calyces and ovigerous swellings a medium brown.

DISTRIBUTION OF THE ISIDÆ COLLECTED BY THE SIBOGA EXPEDITION.

List of Stations

at which Isidæ were collected by the Siboga Expedition, and a
List of Species collected at each Station.

STATION 45. 7° 24 S., 118° 15'.2 E. 794 meters. Fine grey mud, with some radiolariæ and diatomes. *Acanella* sp.?

STATION 52. 9° 3'.4 S., 119° 56'.7 E. 595 meters. Globigerina ooze. *Ceratoisis philippinensis*, *Ceratoisis paucispinosa*.

STATION 71. Makassar and surroundings. Up to 32 meters. Mud, sand with mud, coral. *Isis hippuris.*

STATION 74. 5° 3'.5 S., 119° 0' E. 450 meters (chart). Globigerina ooze. *Acanella weberi.*

STATION 85. 0° 36'.5 S., 119° 29'.5 E. 724 meters. Fine grey mud. *Acanella sibogæ.*

STATION 87. 0° 32' S., 119° 39'.8 E. 655 meters. Fine, grey mud. *Ceratoisis wrighti.*

STATION 117. 1° 0'.5 N., 122° 56' S. 80 meters (chart). Sand and coral. *Mopsea flava.*

STATION 122. 1° 58'.5 N., 125° 0'.5 E. Near Menado, Celebes. 1264—1165 meters (chart). Stone. *Ceratoisis philippinensis*, *Ceratoisis* spec.

STATION 133. Anchorage off Lirung, Salibabu Island. Up to 36 meters. Mud and hard sand. *Isis hippuris.*

STATION 142. Anchorage off Laiwui, coast of Obi Major. 23 meters. Mud. *Isis hippuris.*

STATION 144. Anchorage North of Salomakië (Damar) Island. 45 meters. Coral bottom and Lithothamnion. *Isis hippuris.*

STATION 145. 0° 54' S., 128° 39.9 E. 827 meters. Hard. Pumice stone. *Peltastisis uniserialis.*

STATION 149. Fau anchorage and lagune, West coast of Gebé Island. 31 meters. Coral. *Isis hippuris.*

STATION 156. 0° 29'.2 S., 130° 5'.3 E. 469 meters. Coarse sand and broken shells. *Mopsea alba.*

STATION 159. 0° 59'.1 S., 129° 48'.8 E. 411 meters. Coarse sand. *Peltastisis uniserialis.*

STATION 170. 3° 37'.7 S., 131° 26'.4 E. 924 meters. Fine grey mud. *Acanella sibogæ.*

STATION 173. 3° 27' S., 131° 0'.5 E. 567 meters. Fine yellow grey mud. *Ceratoisis philippensis.*

STATION 178. 2° 40' S., 128° 37'.5 E. 835 meters. Blue mud. *Acanella sibogæ*, ?*Ceratoisis philippinensis.*

STATION 211. 5° 40'.7 S., 120° 45'.5 E. 1158 meters. Coarse grey mud. *Acanella sibogæ.*

STATION 241. 4° 24'.3 S., 129° 49'.3 E. 1570 meters. Dark sand, with small stones. *Acanella sibogæ.*

STATION 258. Tual anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral. *Isis hippuris.*

STATION 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells. *Isis reticulata.*

STATION 279. Ruma-Kuda Bay, Roma Island. 36 meters. Mud and sand. *Isis hippuris.*

STATION 300. 10°48'.6 S., 123°23'.1 E. 918 meters. Fine grey mud. *Peltastisis cornuta.*

STATION 301. 10°38' S., 123°25'.2 E. 22 meters. Mud, coral and Lithothamnion. *Isis hippuris.*

STATION 303. Haingsisi, Samau Islands. Up to 36 meters. Lithothamnion. *Isis hippuris.*

It appears from the above list that *Isidæ* were collected at 26 stations during the Siboga Expedition. By far the most widely spread of the species collected, so far as the territory covered by the Siboga is concerned, is *Isis hippuris*, which was secured from 9 stations, over one third of the total number. It is a somewhat remarkable fact that in only two cases (one of which is uncertain) were more than a single species taken from one station; while no station yielded more than two species of *Isidæ*. Contrasted with the 17 species of *Muriceidæ* from Station 310, this seems a decidedly pour showing.

The genus *Isis* is the only one that can be regarded as comprising distinctly shallow water forms, its range being from 22 to 45 meters. All of the other genera are truly inhabitants of the deep water, the bathymetric distribution of the Siboga material being as follows:

Ceratoisis, 595 to 1264 meters; *Acanella*, 450 to 1570 meters; *Mopsea*, 80 to 469 meters; *Peltastisis*, 827 to 918 meters.

Literature cited

in the Report on the Isidæ of the Siboga collection.

BOURNE, G. C. A Treatise of Zoology, edited by E. RAY LANKESTER; Part II, The Anthozoa, Chapter VI, The Anthozoa, London, 1900.

DANA, J. D. Synopsis of the Report on Zoophytes of the U. S. Exploring Expedition around the world, Under C. WILKES, U. S. N. Commander, in the years 1838—1842, New Haven, 1859.

ESPER, E. J. C. Die Pflanzenthiere in Abbildungen nach der Natur, mit Farben erleuchtet nebst Beschreibungen, Nürnberg, 1791.

ELLIS, J. and SOLANDER, D. The Natural History of many curious and uncommon Zoophytes, London, 1786.

GRAY, J. E. Synopsis of the Families and Genera of the Axiferous Zoophytes or Barked Corals. Proceedings of the Zoological Society of London, Part 25, London, 1857.

—— Catalogue of Lithophytes or Stony Corals in the collections of the British Museum, London, 1870.

HICKSON, S. J. National Antarctic Expedition. Natural History, Vol. III, Cœlentera Alcyonaria, 1907.

KÖLLIKER, A. Icones Histiologicæ, oder Atlas der vergleichenden Gewebelehr, 2. Abth., 1. Hf., Leipzig, 1865.

LAMARCK, J. B. P. A. DE. Histoire naturelle des Animaux sans vertèbres, Vol. II, Paris, 1836.

LAMOUROUX, J. F. V. Histoire des Polypiers coralligènes flexibles, vulgairement nommés Zoophytes, Caen, 1816.

LINNÉ, C. Hortus Cliffortianus, 1737.

—— Systema Naturæ, 10th Edition, 1758.

—— Systema Naturæ, 12th Edition, Tome 1, Part 2, Holmae, 1767.

MILNE EDWARDS, H. et HAIME, J. Histoire naturelle des Coralliaires ou Polypes proprement dits, Tome premier, Paris, 1857.

NUTTING, C. C. Descriptions of the Alcyonaria collected by the U. S. Bureau of Fisheries Steamer Albatross in the vicinity of the Hawaiian Islands in 1902. Proceedings of the U. S. National Museum, Vol. XXXIV, Washington, 1908.

PALLAS, P. S. Elenchus Zoophytorum, Hague, 1766.

STUDER, TH. Übersicht der Anthozoa Alcyonaria, welche während der Reise S. M. S. Gazelle um die Erde gesammelt wurden. Monatsbericht der Königlich Preussischen Akademie der Wissenschaften zu Berlin, September und October 1878, Berlin, 1878.

—— Versuch eines Systemes der Alcyonaria. Archiv für Naturgeschichte, 53ster Jahrgang, Bd. 1, Heft I, 1887.

—— Alcyonaires provenant des Campagnes de l'Hirondelle (1886—1888). Résultats des Campagnes scientifiques accomplies sur son yacht par Albert 1er, Prince Souverain de Monaco, Fascicule XX, Monaco, 1901.

THOMSON, J. A. and HENDERSON, W. D. An account of the Alcyonarians collected by the Royal Indian Marine Survey Ship Investigator in the Indian Ocean. Vol. I, The Alcyonarians of the Deep Sea, Calcutta, 1906.

—— and SIMPSON, J. J. An account of the Alcyonarians collected by the Royal Indian Marine Survey Ship Investigator in the Indian Ocean. Vol. II, The Alcyonaria of the Littoral Area, Calcutta, 1909.

VERRILL, A. E. Report on the Anthozoa, and on some additional Species dredged by the Blake in 1877—1879, and by the U. S. Fish Commission Steamer Fish Hawk in 1880. Bulletin Museum Comparative Zoology at Harvard College, Vol. XI, N⁰ 1, Cambridge, 1883.

WRIGHT, E. P. Notes on Deep Sea Dredging, Annals and Mag. of Nat. Hist., 4th Ser., Vol. 2, p. 423, 1868.

—— On a New Genus of Gorgonidæ from Portugal. Ann. and Mag. of Nat. Hist., 4th Ser., Vol. 3, p. 23, 1869.

—— and STUDER, TH. Report on the Alcyonaria. Report on the Scientific Results of the Voyage of H. M. S. Challenger, etc. Zoology, Vol. XXXI, London, 1889.

EXPLANATION OF PLATES

The photographs were made from nature by the author.
The spicules were drawn under the camera lucida by Mr. DAYTON STONER.

PLATE I.

Fig. 1. *Isis hippuris* Linnæus. Natural size. 1*a*, part of branch × 5. 1*b*, cross section of axis × 5.
Fig. 2. *Isis reticulata* Nutting. Natural size. 2*a*, part of branch × 5.

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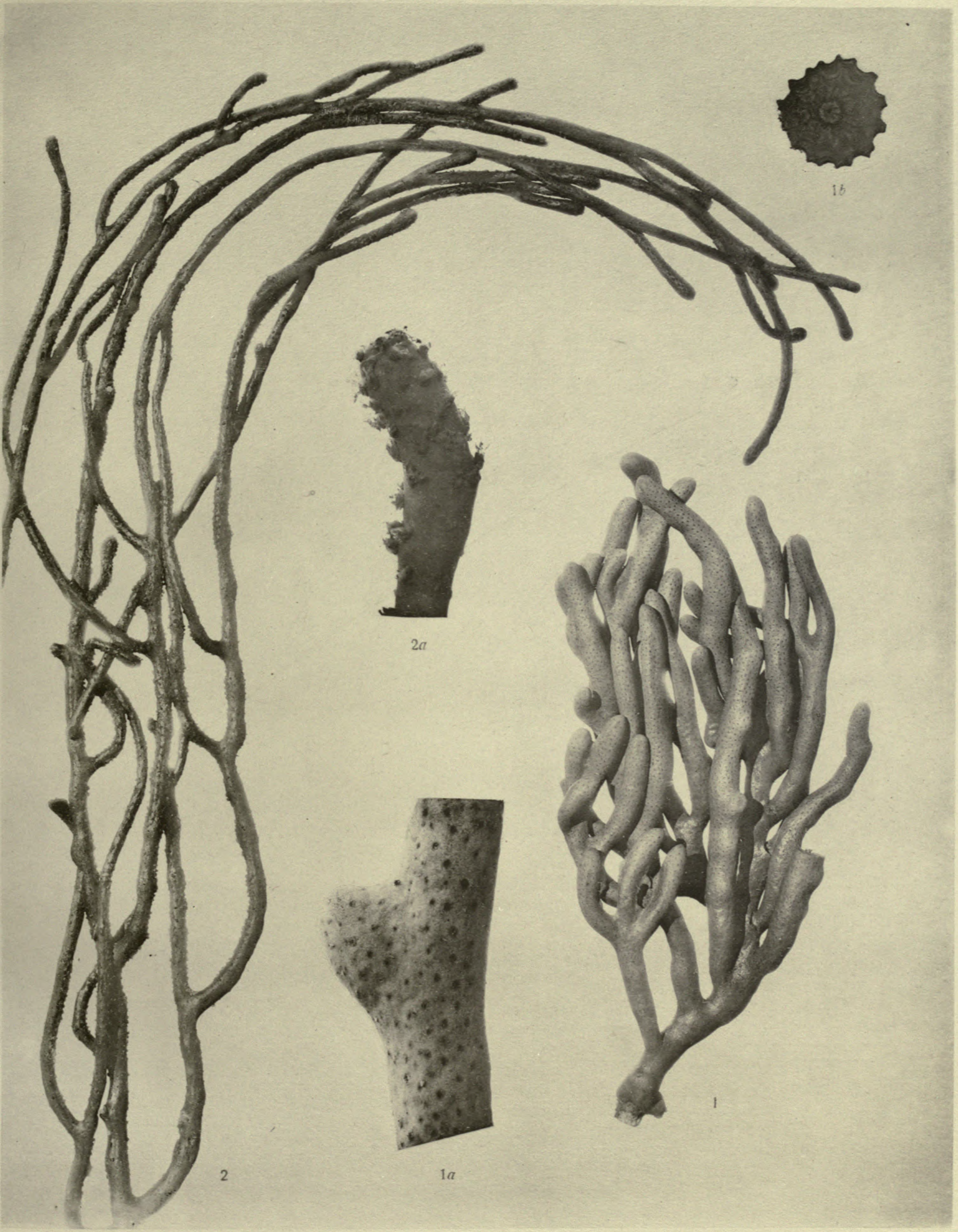

PLATE II.

Fig. 1. *Ceratoisis wrighti* Nutting. Natural size. 1*a*, part of stem × 5.

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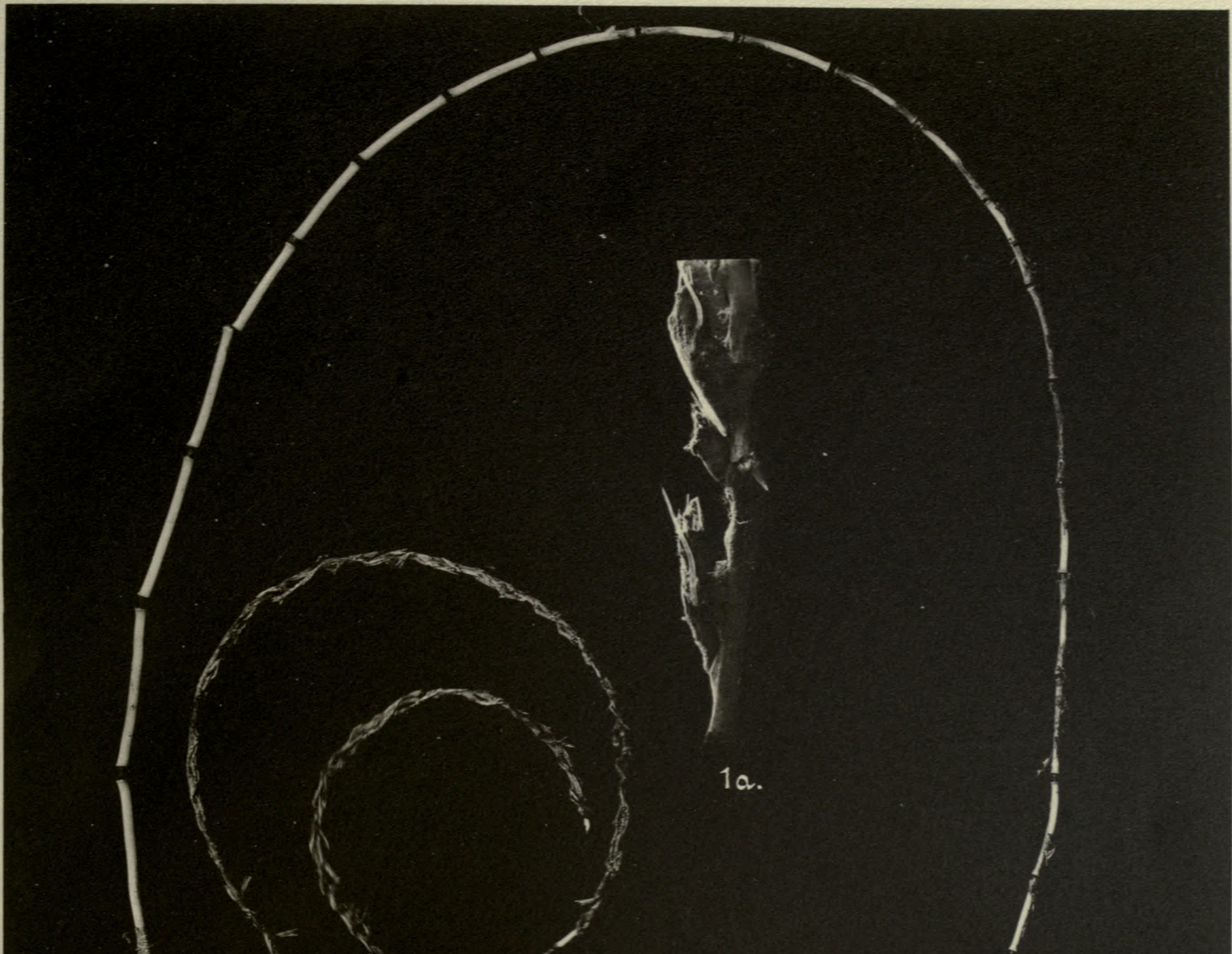

PLATE III.

Fig. 1. *Acanella weberi* Nutting. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Acanella sibogæ* Nutting. Natural size. 2*a*, part of branch × 5.

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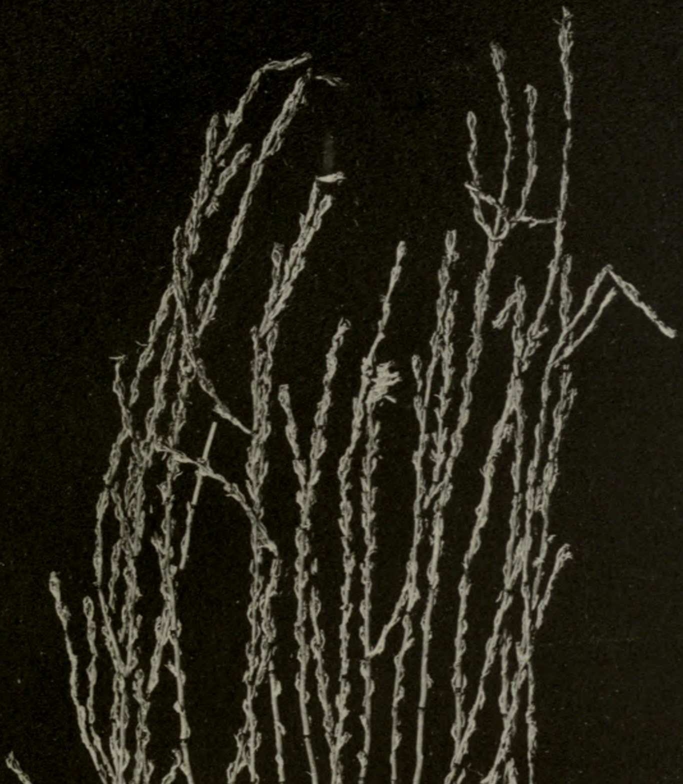

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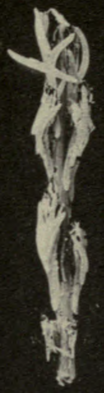
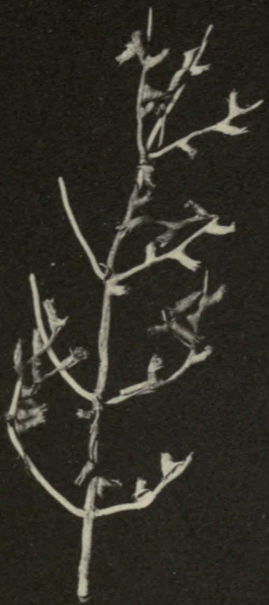


1a.



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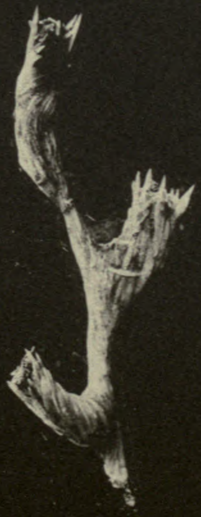
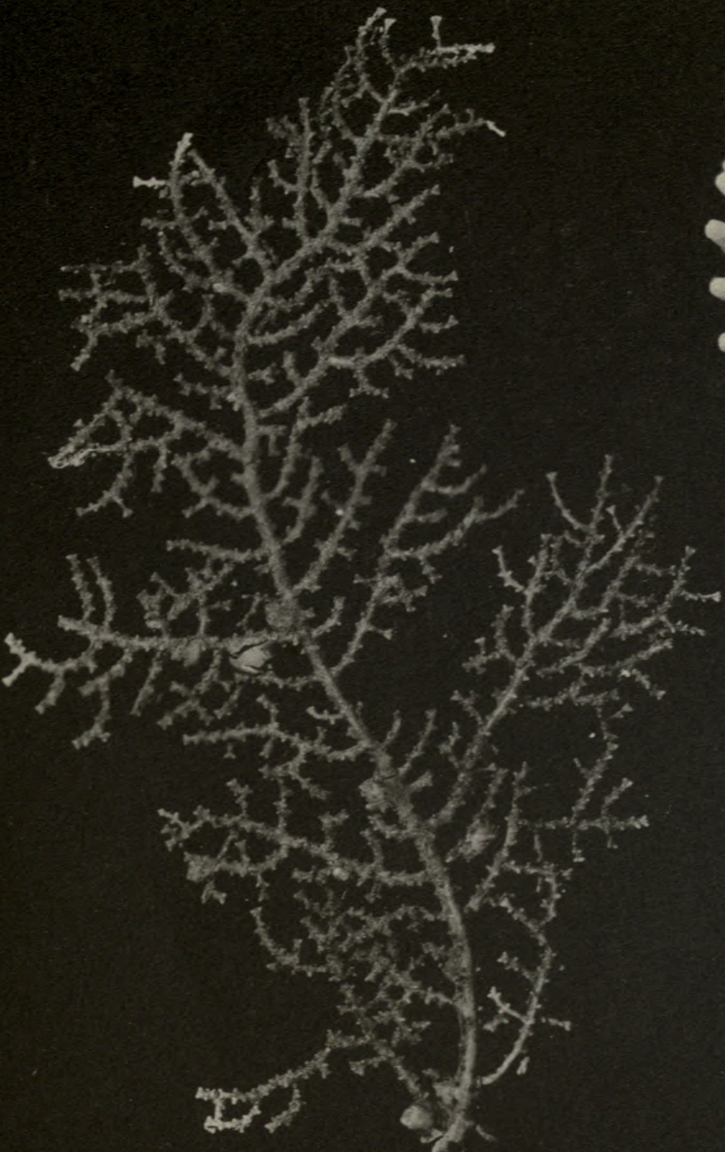


2a.

PLATE IV.

Fig. 1. *Mopsea flava* Nutting. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Mopsea alba* Nutting. Natural size. 2*a*, branch × 5.
Fig. 3. *Peltastisis uniserialis* Nutting. Natural size. 3*a*, part of stem × 5.
Fig. 4. *Peltastisis cornuta* Nutting. Natural size. 4*a*, part of stem × 5.

UNIV. OF CALIFORNIA



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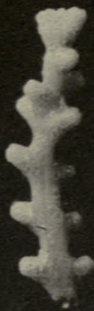

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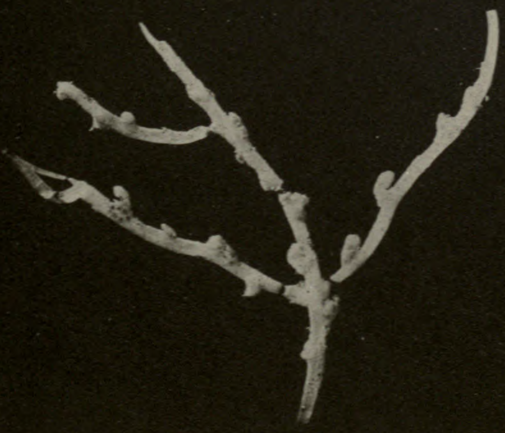

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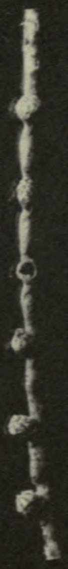

4a.

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PLATE V.

Fig. 1. Group of six spicules, *a, b, c, d, e, f,* of *Isis hippuris* Linn. × 120.

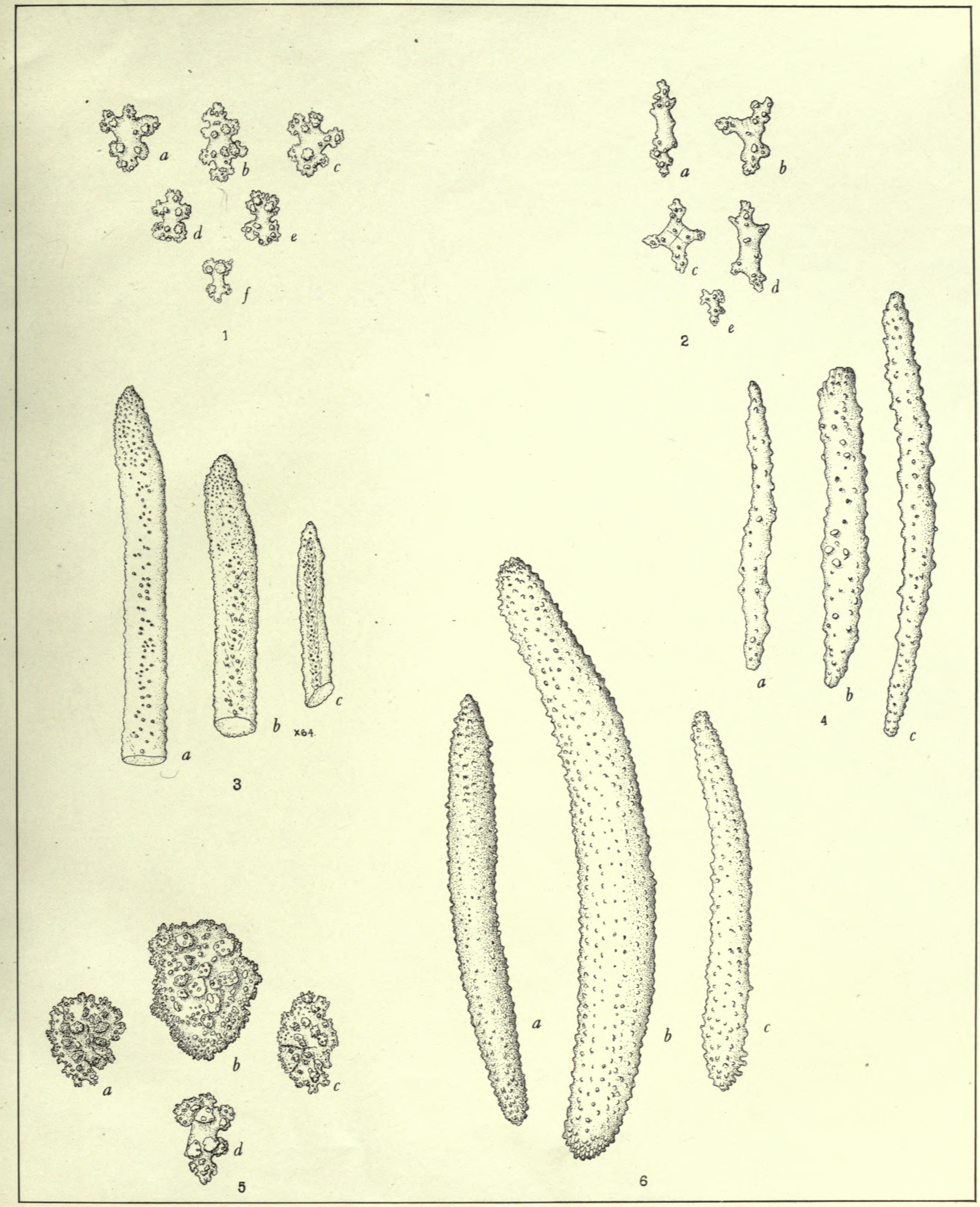
Fig. 2. Group of five spicules, *a, b, c, d, e* of *Isis reticulata* Nutting × 120.

Fig. 3. Group of three spicules, *a, b, c,* of *Ceratoisis wrighti* Nutting × 64. (Approximately one half of each spicule is shown).

Fig. 4. Group of three spicules, *a, b, c,* of *Acanella sibogæ* Nutting × 120.

Fig. 5. Group of four spicules, *a, b, c, d,* of *Mopsea flava* Nutting × 120.

Fig. 6. Group of three spicules, *a, b, c,* of *Acanella weberi* Nutting × 120.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Jackson Stoner del.

PLATE VI.

Fig. 1. Group of eight spicules of *Peltastisis cornuta* Nutting. *a,* one of the opercular spicules; *b,* one of the spindles of the cœnenchyma; *g,* a spicule intermediate between the calyx scales and the spindles of the cœnenchyma; *c, d, e, f, i,* scales from the calyx walls. All × 120.

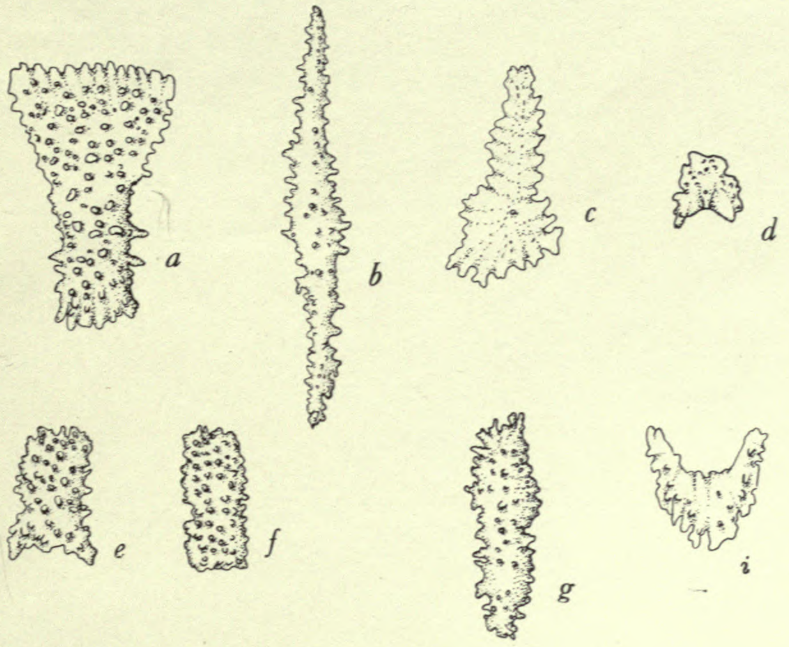
Fig. 2. One of the "bony stays" consisting of a single peculiar spicule of *Peltastisis cornuta* Nutting × 64.

Fig. 3. Group of five spicules from *Peltastisis uniserialis* Nutting × 120. *e,* one of the characteristic triangular spicules of the operculum; *a, b, c,* spindles from the cœnenchyma; *d,* calyx scale.

Fig. 4. Group of six spicules, *a, b, c, d, e, f,* from *Mopsea alba* Nutting × 120.

Fig. 5. Calyx of *Peltastisis cornuta* Nutting × 64. *op.,* opercular scale; *s.* curious "bony stay" which is formed of a single very large spicule and supports the calyx in front.

UNIV. OF CALIFORNIA



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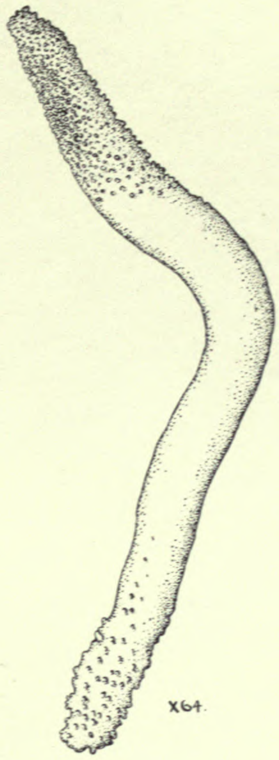

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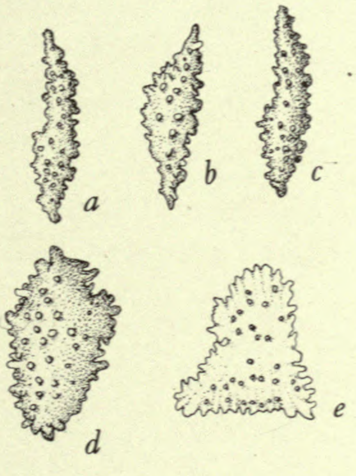

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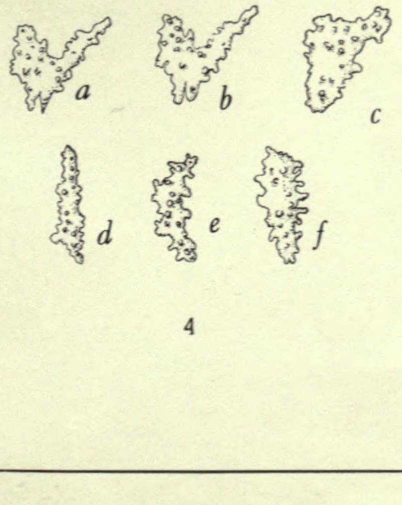

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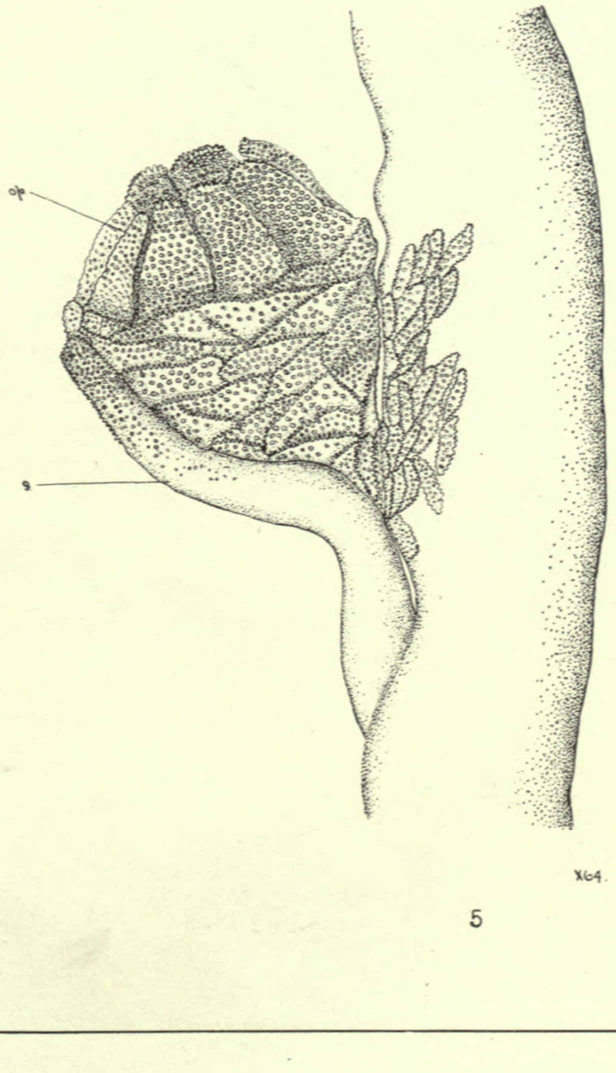

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REESE

THE GORGONACEA OF THE SIBOGA EXPEDITION

VI. THE GORGONELLIDÆ

REESE

Siboga-Expeditie
XIII b³

THE
GORGONACEA OF THE SIBOGA EXPEDITION

VI. THE GORGONELLIDÆ

BY

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With 11 plates

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and the tentacle bases are beset with spicules. The spicules are almost always girdled forms, i. e. with a median band which is bare of verrucæ, and hence appear to have an impressed girdle. This results in the formation of double heads, double clubs, double spindles, double stars, etc.; and these forms are quite characteristic of the Gorgonellidæ, although not strictly confined to this family.

Dichromatism is exhibited in a marked degree, a number of species of *Juncella* and *Scipearella* being characterized by having two color phases, red and white, which do not appear to be corellated with sex or age.

The systematic arrangement of this family offers great difficulties, as is apt to be the case with forms which have been long known. The original descriptions are entirely inadequate, and it is usually impracticable to decide just what forms the authors had before them. None of them paid any attention to the feature that has later been found of prime importance in generic definitions, e. g. the spicules, and confined themselves almost exclusively to general habit, mode of branching, etc., features of almost no generic import whatever. Subsequent writers have very generally neglected the discussion of the genera in any broad way.

MILNE EDWARDS and HAIME (1857) recognize the four genera *Juncella*, *Ctenocella*, *Gorgonella* and *Verrucella*, which they separated by modes of branching and character of the calyces. Kölliker (1865) was the first to thoroughly investigate the spicules of this family, and he recognized the genera *Gorgonella*, *Juncella* and *Verrucella*; but included the genus *Riisea* of DUCHASSAING and MICHELOTTI, which appears to belong to the family Chrysogorgidæ. He includes the genus *Ctenocella* in his genus *Gorgonella*.

GRAY (1870) divides the genus *Juncella* into the three genera *Juncella*, *Ellisella* and *Vimenella* and restores the genus *Scirpearea*. He established the genera *Nicella*, *Reticella*, *Raynerella*, *Phenella* and *Heliana*. Two of these, *Reticella* and *Raynerella*, appear to belong to *Gorgonella*.

STUDER, (1878) discusses and further defines the genera *Gorgonella*, *Juncella*, *Ellisella*, *Ctenocella* and *Scirpearella*; and in 1887 the same writer gives a careful discussion of the genera of this family, defining according to modern methods the following genera: *Nicella*, *Scirpearea*, *Juncella*, *Ellisella*, *Verrucella*, *Gorgonella*, *Ctenocella*, *Phenelia* and *Heliana*. The last two of these genera he defines after GRAY without giving the spicule characters which are absolutely necessary for modern definition. This treatment is the most satisfactory that has yet been presented, and the generic definitions here given are very largely adopted without essential modification by the present writer.

The last general treatment of the family Gorgonellidæ as a whole is found in WRIGHT and STUDER's Challenger Report, Alcyonaria, 1889, p. 153, where the definitions of STUDER, as just discussed, are practically adopted in their entirety. They add, however, one genus, *Scirpearella* and throw doubt on the identity and validity of the old genus *Scirpearea* of CUVIER, quoting the discussion of *Scirpearea mirabilis* by KÖLLIKER[1] who shows that the name was originally used for a pennatulid.

THOMSON and SIMPSON, in their excellent monograph of the Alcyonaria secured by the

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[1] Anat.-Syst. Beschr. der Alcyonarien, Die Pennatuliden, 1872, p. 26.

Investigator in the Indian Ocean, Part II, 1909, p. 265 et seq. merely name the family. They distinctly recognize the great difficulty and perplexity attending the work of the systematist in this family, saying (p. 267), in reference to their new species *Nicella pustulosa*:

"It is a matter of no small difficulty to distinguish between *Nicella*, *Gorgonella* and *Verrucella*. Distinctions based on spicules alone are very unsatisfactory in this group because the spiculation varies at different levels and transition forms are so numerous and varied that it is sometimes almost impossible to distinguish between double spheres, double stars and double clubs, each in turn passing gradually to double spindles".

Again, on page 269:

"The system of classification which at present obtains in regard to the Juncella group of gorgonellids, including *Juncella*, *Ellisella*, *Scirpearea* and *Scirpearella* is far from satisfactory. In fact it is a debatable question whether these should be ranked as separate genera. Many of the species which have from time to time been described have unquestionably been established on young colonies, and, in addition to this, the characters which are taken as diagnostic, e. g. arrangement and retractility of verrucæ, vary so much in individual specimens that little or no importance can be attached to them".

These writers content themselves with a table, giving a comparison in numerous details of the several specimens collected by the Investigator, without attempting to name them.

The present writer, although profoundly impressed with the extreme difficulty of the problem, does not feel justified in turning his back on these perplexities. The amount of material belonging to the Gorgonellidæ secured by the Siboga Expedition is so considerable, representing some 21 species, that an attempt will be made to straighten out as many of the difficulties as may be. While entire success is not to be hoped for, some progress toward a reasonably correct generic classification should be possible.

First, however, it is necessary to more clearly define the main types of spicules that present, after all, the best basis of classification in this, as in other groups.

As already indicated, nearly all of the spicules which present characteristic features of value for our purpose are "girdled spicules". The basic form from which nearly all of the others are derived is the girdled spindle, showing at its middle a smooth impressed zone, free from verrucæ. This form differs from the typical spindle only in the fact that this zone is more conspicuous in the girdled form. The typical spindle is terete in form and its surface is ornamented with more or less regular whorls of tubercles. Between the whorls are comparatively bare zones, and such a zone is very constantly seen near the centre of the spicule. It is only when such a zone is comparatively large and conspicuous that a "girdled spindle" is produced. This basic form is modified in the following ways:

1st. Symmetrical forms

a. The girdle divides two similar parts of the original spindle in such a manner that each part bears verrucæ and is terete in outline. This produces the . . . . Double Spindle.

b. The girdle divides two similar parts each with its outer end somewhat turgid and armed with verrucæ, resulting in the. . . . . Double Club.

c. The girdle divides two similar parts which are spherical in outline and are ornamented with symmetrically disposed verrucæ. Such an arrangement results in the spicule which we will call the. . . . Double Head.

d. The girdle divides two similar parts which are spherical in outline and ornamented with radiating points. These are . . . . Double Stars.

e. The spicule is rod-like in general form, with a girdle dividing two parts which are gradually enlarged toward the outer ends, have comparatively straight sides, rounded distal corners and are covered with fine and densely aggregated verrucæ. These will be called . Double Bars.

f. The spicule is rod-like, without the girdle. . . . . Bars.

2nd. Unsymmetrical forms.

a. The girdle separates two unlike parts, one a club and the other a star. Such forms may be called . . . . Club-Stars.

b. The girdle separates two unlike parts, one a club and the other a head. Forms of this kind may be called . . . . Club-Heads.

c. The girdle separates two unlike parts, one a star and the other a head. These will be called . . . . Star-Heads.

d. The girdle separates two unlike parts, one a club and the other a spindle. This rather rare form may be called . . . . Club-Spindle.

e. The girdle separates two unlike parts, one a star and the other a spindle. These may be designed as . . . . Star-Spindles.

Besides the above, which may be called girdled forms, there are often crosses produced by a double head being longitudinally divided by an impressed vertical zone.

While it is true that a given species, or even a single specimen, may show several of these forms and numerous intergradations, it is also true that certain forms predominate in a given genus, and it is these dominant types of spicules, and not the others, that are available for generic diagnosis [1].

While the spicules are the most important features for generic distinctions, we may also avail ourselves of any other character which seems to be possessed by a group of allied species, e. g. mode of branching, shape of calyces, character of axis, etc., in attacking the problem before us.

Artifical key to the genera of the Gorgonellidæ.

Main branches arising from a forking of the main stem. Colony flabellate, widely diverging, the main branches bearing a series of simple branchlets on upper side only. Branchlets vertical and parallel, and resembling the teeth of a comb . . . . **Ctenocella**

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[1] See a discussion on this point, as well as a statement of the position of the author on the matter of the retention of established generic names, in the Report on the Muriceidæ of the Siboga Expedition, Nutting, 1910, p. 5.

Colony simple, or, if branched, not bearing branchlets in the manner described above. Spicules:	
Club-stars and double stars	**Juncella**
Lenticular, disk-shaped or fiddle-shaped	**Plumigorgia**
Much larger, bar-shaped, sometimes lenticular; surface smooth	**Isidoides**
Double bars or girdled bars	**Nicella**
Spindles and clubs predominating	**Ellisella.**
Double heads and girdled spindles largely predominating.	
Colony flabellate, often reticulate; calyces low verrucæ	**Gorgonella.**
Colony flabellate or dichotomous, the heavily spiculated bases of tentacles forming an 8-rayed pseudo-operculum, star-like when viewed from above	**Verrucella**
Colony simple, forked or bushy; calyces usually in spirals, prominent; spicules often cruciform, although not abundant	**Scirpearella**

The genus *Scirpearea* is apparently invalid, as the name was used originally for a pennutalid, according to Lamarck[1].

Later Lamarck (Hist. Nat. Anim. sans vert., II, 1836, p. 614) places this in his genus *Funiculina*. This writer points out that this species has been erroneously confounded with *Pennatula mirabilis* Linn. Wright and Studer (Challenger Report, Alcyonaria, 1889, p. 155) say that the type specimen of *Funiculina cylindrica* Lamk. is a gorgonellid (and probably a *Juncella*). Studer, however, had previously figured a couple of spicules of *Scirpearea mirabilis* Cuv. in the plate (Plate V, 29) and *Scirpearea mirabilis* Pallas in the text, of his paper in the Monatsbericht der Königl. Akad. der Wissenschaften zu Berlin, 1878, p. 660.

It is impossible at this time to disentangle the real situation and to determine just what Cuvier had before him which he named *Scirpearea mirabilis*. In view of this situation it seems best to abandon the genus altogether.

The following genera are not represented in the collection made by the Siboga, neither do they seem to have received adequate definition at any time. Without further discussion the definitions of Studer[2] are given in translation as follows:

"*Phenilia* Gray. Colony arborescent, with short, divergent, usually quadrate branches which sometimes coalesce. Calyces low, in two or three irregular rows on both sides of the branches. Cœnenchyma horny, with plain lateral grooves. Spicules?"

"*Heliana* Gray. Colony tree-like, branching dichotomous? Twigs ascending and divergent. Lower twigs occassionally anastomosing. Cœnenchyma hard, horny. Calyces exserted, subcylindrical short, sometimes bent, in two three or four alternating rows on the sides of the twigs, and irregularly disposed on the branches. Axis hard, stony, gray-brown".

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[1] *Scirpearea mirabilis* Cuvier, (Règne Animal, 1 ed. IV, 1817, p. 85) *Pennatula mirabilis* Pallas.

[2] Versuch eines Systemes der Alcyonaria, 1887, pp. 68, 69.

Synoptic view of the genera and species of GORGONELLIDÆ collected by the Siboga Expedion.

New species are indicated by an asterisk (*).

Gorgonella.

G. orientalis, *umbraculum*, **delicatula*, **rigida*.

Verrucella.

V. rubra, *flaviflora* (new name), **stellata*.

Ctenocella.

C. pectinata.

Juncella.

J. juncea, *gemmacea*, *racemosa*, **sanguinea*.

Scirpearella.

S. rubra, *gracilis*, **regia*, **hemispherica*.

Nicella.

N. **coralloides*, **carinata*.

Ellisella.

E. **flava*.

Plumigorgia (new genus).

P. **hydroides*.

Isidoides (new genus).

I. **armata*.

The table shows that the Siboga Expedition secured 21 species of Gorgonellidæ 11 of which are new; and that these species were divided among 9 genera, 2 of which are new.

Systematic description of genera and species.

Genus **Gorgonella** Valenciennes (modified).

Gorgonella Valenciennes. Comptes-rendus, tome XLI, 1855, p. 14.
Gorgonella Milne Edwards et Haime. Histoire Naturelle des Coralliaires, Vol. I, 1857, p. 183.
Gorgonella Kölliker. Icones Histiologicæ, II, 1865, p. 139.
Gorgonella Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 661.
Gorgonella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 68.
Gorgonella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXVI.
Gorgonella (Val. emended), Délage et Hérouard. Traité de Zoologie concrète, II, 2, 1901, p. 428.
Gorgonella Hickson. Alcyonaria of the Maldives, 1905, p. 817.

The original discription of this genus is as follows:

"Le sclerobase ramifie en fines branches rameuses et très-divisées".

MILNE EDWARDS and HAIME (1857) define the genus as follows:

"Colony much branched, cœnenchyma very thin; calyces included or but little exserted". (Translation).

KÖLLIKER (1865) appears to have been the first to make a critical study of the spicules of this genus. His definition, freely translated, is as follows:

"Axis commonly without layers, radiately striated. Calyces when evident, low warts. Spicules of the cœnenchyma warty double spheres and double spindles. .07 to .1 mm. in length Polyp spicules are spindles .13 mm. long.

Studer (1878) accepts the genus as originally defined by Valenciennes, and in 1887 he formally defined the genus as follows:

"*Gorgonella* Milne Edwards et Haime. Colonie mannigfach in einer Ebene verzweigt, oft durch Anastomosen der Zweige ein Netzwerk bildend. Kelche niedrig warzenförmig an zwei Seiten der Äste angeordnet. Achse lamellös, radienstreifig. Im Cœnenchym warzige Doppelkugeln und Doppelspindeln".

Wright and Studer (1889) define the genus practically as just quoted. Hickson (1905) points out the difficulty in distinguishing between *Gorgonella* and *Verrucella.*

The definition adopted for the present work will be as follows:

Colony flabellate, often reticulate; calyces low dome-shaped, or low truncated cones; calyces on two or three sides of the branches, usually the former except on ultimate branches; cœnenchyma thin; axis solidly calcareous, without horny lamellæ; spicules double heads, girdled spindles and true spindles.

The type species of this genus is *Gorgonella sarmentosa* (Lamarck). Other known species are *Gorgonella bianci* Koch, *G. distans* Studer, *G. granulata* Esper, *G. miniacea* W. and S., *G. orientalis* W. and S., *G. stricta* (Lamk.), *G. sarmentosa* (Lamk.), *G. umbella* (Esper), *G. umbraculum* (Ellis and Solander), *G. verriculate* Milne Edw. and Haime, and the new species of the Siboga collection.

The writer believes that *Nicella reticulata* and *N. pustulosa* of Thomson and Simpson (Alcyonarians of the Indian Ocean, Vol. 2, 1909, pp. 266, 267) should be included in the Genus *Gorgonella.* Their spicules are typical of that genus rather than of *Nicella.*

1. *Gorgonella orientalis* Wright and Studer.

Gorgonella orientalis Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 161.

Stat. 274. 5° 28'.2 S., 134° 53'.9 E. 57 meters.
Stat. 305. Mid channel in Solor Strait off Kampong Menanga. 113 meters.
Stat. 306. 8° 27' S., 122° 54'.5 E. 247 meters.
Stat. 310. 8° 30' S., 119° 7'.5 E. 73 meters.

Colony (fragmentary) flabellate and reticulate in form. The specimen described is the terminal part of a branch of a colony that was probably much larger. Height 6.1 cm., diameter 5.6 cm. The central branch is connected by numerous anastomoses with two others, one on each side. The diameter of the largest branch is 2.5 mm. This forks 4 mm. above its proximal end and each of the resulting branches gives off several lateral branchlets that anastomose freely with branchlets from other branches. Ultimate branchlets from 1.5 mm. to 9 mm. apart. The calyses are distributed on three sides of the branches, are thickly emplanted, and have a tendency to a lateral arrangement. There is no evident longitudinal furrow or ridge on the branches.

The individual calyces are rather low, dome-shaped verrucæ with evenly rounded summits and with their walls often contiguous. Their distal ends show a faintly indicated rosette or star-shaped pattern, not nearly so evident as in *Verrucella.* A typical calyx measures .9 mm. in height and has a diameter of 1.8 mm. The walls are remarkably thick and tough, consisting of a dense mass of spicules immersed in a tough matrix of connective tissue. The polyps are completely retractile and the upper surfaces of the tentacles are encrusted with spicules, many of which are transversely placed.

The axis is hard, calcareous and without corneous layers.

Spicules. These are double heads and girdled spindles whose surfaces are covered with verrucæ which are often in whorls and not so massed together as in *Nicella*. There are also true symmetrical spindles with pointed ends and regular whorls of verrucæ; and many intergradations between the double heads and girdled spindles, and between the latter and true symmetrical spindles. A few crosses are also seen.

Color. The colony is yellowish brown in color, ocraceous in places, and also shows areas of grayish brown. The polyps are colorless in alcohol.

General distribution. The type locality is the *Hyalonema* ground, off Japan. 345 fathoms.

This specimen is referred with some hesitation to this species. Taking into account the changes in form of the calyces in different stages of contraction it agrees fairly well with the original description.

2. *Gorgonella umbraculum* (Ellis and Solander).

Gorgonia umbraculum Ellis and Solander. Natural History of Zoophytes, 1787, p. 80.
Gorgonia umbraculum Lamouroux. Exposition Méthodique, 1821, p. 34.
Rhipidigorgia umbraculum Valenciennes. Comptes rendus, Acad. Sci., Paris, 1855, p. 13.
Rhipidigorgia umbraculum Milne Edwards et Haime. Hist. nat. des Coralliaires, 1857, p. 178.
Umbracella umbraculum Gray. Proc. Zool. Society of London, 1857, p. 288.
Gorgonella umbraculum Verrill. Bull. Museum of Comp. Zool., 1864, p. 37.
Gorgonella umbraculum Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 118.

Stat. 204. 4°20′ S., 122°58′ E. 75 to 94 meters.

Colony strictly flabellate and reticulate, 15 cm. in height and with a spread of 8.2 cm. Main stem 2.7 cm. long and 2.8 mm. in diameter. At its distal end it breaks up into three branches, one of which forms nearly the whole of the specimen. This branch is fairly symmetrical in itself. Considering it as a colony its main stem is 14 mm. long and 2.6 mm. in diameter, round in section and devoid of calyces. It can be traced for 4.4 cm. before it breaks up and is dissipated in the general network of the colony. It gives off alternate branches which are short or feebly branched, except the upper one which curves upward and outward nearly to the top of the colony, giving off numerous lateral twigs which go to form the reticulate mass. The anastomoses are quite numerous. The ultimate branchlets are very short, and about 3.6 mm. apart, and very slender, being about 1 mm. in diameter. One side of the branched colony is devoid of calyces. The latter are in two alternating rows, but are not strictly lateral being more on the side opposite the nude face, and, if that be regarded as anterior, being antero-lateral in position.

The calyces are more like truncated cones than verrucæ; or, they may be likened to domes with their tops removed. A typical one measures 1.1 mm. in height and 1.5 mm. in diameter. The top is flattened, not rounded as in *G. rigida*, and there is a distinct series of 8 lobes around the margin. The dorsal surface of the tentacles bears a number of spicules, principally girdled spindles.

The cœnenchyma is thin, and the axis solidly calcareous.

Spicules. These are mostly double heads and girdled spindles, as in the last species. A few small, regular tuberculate spindles and clubs are also seen. The tubercles, although closely set, are usually plainly in whorls on the spindles. Sometimes the girdle is obliterated by such a whorl.

Color. The colony is bright scarlet throughout.

General distribution. The type locality is Batavia; East Indies in general.

3. *Gorgonella delicatula* new species. (Plate I, figs. 2, 2*a*; Plate X, fig. 1).

Stat. 257. In Duroa Straits, Kei Islands. To 52 meters.

Specimens fragmentary, the largest being a flabellate branch, incomplete at both ends, 5.4 cm. long. The main branch is curved in a very open "S", and gives off seven branchlets from one side, four of which are compound; and four branches from the other side, three of which are compound. The branchlets give off ultimate twigs in an irregularly alternate manner. The main branch is but 1.2 mm. in diameter, and the ultimate twigs about .5 mm. The latter are usually regularly curved. The calyces are lateral and alternate in position.

The individual calyces are very low rounded verrucæ, a typical one measuring .5 mm. in height and 1.1 mm. in diameter at the base They are about 1 mm. apart, on the average, and vary greatly in size. The ends of the twigs are swollen, and contain two opposite calyces that are considerably larger than the others. In general, however, the calyces are much smaller than in any other species of this genus in the collection. There are a few minute spicules on the dorsal surfaces of the tentacles, but it is difficult to ascertain their arrangement.

The axis is very hard, calcareous, with very deep grooves or impressions of the water-vascular canals. The cœnenchyma is thin.

Spicules. These are much like those of *Gorgonella rigida*, consisting of very heavily tuberculated girdled spindles, quite stout, oval in outline and with the girdle often obliterated by the encroachment of the tubercles. The double heads are relatively much less abundant than in other species of the genus in the collection, and regularly tuberculate spindles with the tubercles in whorls seem to be lacking.

Color. The colony is bright coral red, distal parts of the calyces yellow and the polyps (in alcohol) white.

This species is much more delicate than any other member of the genus that the writer has seen.

4. *Gorgonella rigida* new species. (Plate I, figs. 3, 3*a*; Plate X, fig. 2).

Stat. 50. Bay of Badjo, West coast of Flores. Up to 40 meters.
Stat. 204. 4°20′ S., 122°58′ E. 75—94 meters.
Stat. 260. 5°36′.5 S., 132°55′.2 E. 90 meters.
Stat. 305. Mid channel in Solor Strait off Kampong Menanga. 113 meters.

Colony incomplete, the basal portion and two large branches being present, flabellate in form. The root forms a lobular mass growing over a pebble. Main stem to first branch 14 mm. long and 1.9 mm. in diameter, round in section. The first branch is large, and grows outward and then curves downward and outward again, and attains a length of 4.6 cm. It gives off four stiff branchlets from its upper side, three of which give off branchings of the 3rd order. Above the first branch the main stem gives off three branches on one side and two on the other. The lower of these latter is a large branch which gives off two branchlets from its lower side (one of which is compound) and three from its upper side (one of which is compound). There are no anastomoses and the branches are all stiff and rigid. One side or face of the branches is devoid of calyces.

The calyces are alternate in position, but are not strictly lateral, being turned toward the face of the colony. The distance between calyces is about 1.3 mm. on the average. The axis is densely calcareous.

The individual calyces are low, dome-shaped verrucæ, one measuring .7 mm. in height and 1.3 mm. in diameter. When the polyp is retracted the calyx mouth is entirely obliterated, not leaving the rosette pattern of lobes often seen in allied forms. The mouth is indicated, however, by a spot of darker red color. The tentacles are heavily spiculated with tuberculate spindles.

Spicules. These are double heads, spindles and girdled spindles. All of these are more densely covered with tubercles than is the case in *G. orientalis*, and the spindles are stouter. Otherwise the spicules are much the same in the two species.

Color. The colony is a rather light scarlet, or coral red throughout. The calyx mouths are darker red, verging on crimson.

The differences in habit of growth, size of calyces and in the spicules seem sufficient to justify the separation of this form from *G. orientalis* and other members of the genus. It is near *G. distans*, Studer, but differs in the disposition of the calyces, which are in three to four rows in *G. distans* and in thickness of stem and branches.

Genus **Verrucella** Milne Edwards et Haime.

Verrucella (in part) Milne Edwards et Haime. Hist. Nat. des Coralliaires, I, 1857, p. 184.
Verrucella Duchassaing et Michelotti. Mémoire sur les Coralliaires des Antilles, 1860, p 33.
Verrucella Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Verrucella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 68.
Verrucella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXVI.
Verrucella Studer. Alcyonaires provenant des Campagnes de l'Hirondelle, 1901, p. 54.
Verrucella Délage et Hérouard. Traité des Zoologie concrète, II, 2, 1901, p. 429.

Verrucella Hickson. Alcyonaria of the Maldives, 1905, p. 817.
Verrucella Nutting. Descriptions of Hawaiian Alcyonaria, 1908, p. 597.

The original definition of this genus is as follows:

"Polypieroide très rameux, sclerenchyme assez épais. Calyces à bords verruciformes très-saillants".

DUCHASSAING et MICHELLOTTI (1860) accept the genus, but do not define it. KÖLLIKER (1865) restricts the genus by separating from it *Juncella gemmacea* (*Verrucella gemmacea* Milne Edwards) and is the first to give careful attention to the spicules. A free translation of his definitiod follows:

"Axis calcareous, without lamellæ. Calyces very pronounced warts. The strongly calcareous bases of the tentacles forming an 8-rayed star within calyx opening. Spicules of the cœnenchyma beset with rounded and conical verrucæ; double heads with transitions to double and simple spindles (in two species with little thorny double stars). Polyp spicules flattened, small warty spindles and double spindles .12 to .20 mm. long, also found in the cœnenchyma, besides many small simple spindles".

STUDER (1887) and WRIGHT and STUDER (1889) adopt the definition of KÖLLIKER without material change. I find no subsequent discussion of the genus which adds anything of importance as to generic characters. The definition adopted for the present work is simply a condensation and modification of that given by KÖLLIKER, as follows:

Gorgonellidæ with calcareous, usually homogeneous axis; colony variously branched but never simple; calyces verruciform, their distal portions rounded and including an 8-rayed star formed by the heavily spiculated tentacle bases. Spicules mainly double heads and girdled spindles intergrading with simple spindles.

The type species of this genus is hard to determine. The first species named by MILNE EDWARDS and HAIME is *Verrucella violacea*; but this species is correctly regarded by KÖLLIKER as not belonging to the genus or family, but to the family Gorgonidæ. This being the case it seems safer to the present writer to indicate as the type *Verrucella guadeloupensis* Duch. et Mich., which conforms strictly to the definition of the genus and is the first species mentioned by KÖLLIKER who was the first to define the genus according to modern methods. Other species are *Verrucella bicolor* Nutting, *V. candida* Ridley, *V. flexuosa* (Lamarck), ? *V. furcata* (Lamarck), *V. granifera* Kölliker, *V. guernei* Studer, *V. rubra* Thomson and Henderson and the new species about to be described.

1. *Verrucella rubra* Thomson and Henderson.

Verrucella rubra Thomson and Henderson. Ceylon Pearl Oyster Report, The Alcyonaria, 1905, p. 314.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 meters.

Colony (incomplete) sparingly branched in a straggling manner, 19.5 cm. high. Stem and branches of about equal diameter (1.5 mm.) troughout. The stem forks about 2.4 cm. from its proximal end. One of the resultant branches sends off a very short simple branchlet

2.8 cm. from its orgin. The remainder of this branch is simple and 9.2 cm. long. The other main branch gives origin to two branchlets, one of which is forked near its end on its inner side and is unbranched throughout its distal 11.6 cm. The stem and branches are round in section and the calyces are entirely included, or so nearly so that the surface seems smooth at first glance. There are, however, very slight swellings that indicate the positions of the polyps. These are mainly lateral in position and tend to form two alternating rows (or one zigzag row) on each side. The front and of the branches are largely devoid or polyps, although they occasionally invade these surfaces.

The individual calyces are indicated by very low swellings and by their mouths, which are 8-rayed in retraction, as is characteristic of the genus. These mouths are about 1.4 mm. apart on the average. The polyps are so strongly retracted that their characters can hardly be made out. The basal portions of the tentacles are thickly encrusted with warty spindles and have no very definite arrangement. There is a tendency, however, to a longitudinal disposition.

A cross section of a branch shows a fairly thick cœnenchyma and an axis which appears to be solidly calcareous without the concentric lamellae of alternating hard and soft layers characteristic of several genera of Gorganellidæ.

Spicules, The outer layer is composed mainly of small very characteristic double heads. The inner cœnenchyma is filled with usually larger girdled spindles, terete spindles, a few double crosses and an occasional very small club.

Color. The entire colony is of a dull pink color.

General distribution. Type locality is in the Gulf of Mannaar.

This specimen has a considerable superficial resemblance to certain slender plexaurids. It is a true gorgonellid, however, but with entirely immersed calyces.

2. *Verrucella flaviflora* new name. (Plate I, figs. 1, 1*a*.);

Stat. 47. Bay of Bima, near South fort. 55 meters.

Colony subflabellate in form, 29 cm. in height. The main stem divides dichotomously four times and attains a height of 12.5 cm. Above the basal forking it is round and 3 mm. in diameter. 1.7 cm. above its base it divides into three branches in a curious manner, as if the outer branch were stuck on to where the others fork. The further branching is dichotomous in the main, but in one large branch it is unilateral, there being six upright and parallel branchlets from one side. The terminal twigs are often quite long, one being about 15 cm. in length. These twigs are flattened, this appearance being exaggerated by the fact that the calyces are bilaterally arranged. A slight elevated ridge or keel is evident on one side of many of the branches, and sometimes this can be seen on both sides. The twigs are 1.7 mm. × 2.2 mm. in cross section. The calyces are all lateral and usually in a single row on each side. They are emplanted, however, alternately toward the front and back of the colony, thus giving the appearance of two rows. They are rather regularly spaced, the distance between them being usually under 1 mm.

The individual calyces are in the form of truncated cones, often somewhat inclined toward the distal end of the branch, but perhaps quite as frequently directed straight outward. A typical calyx measures 1.2 mm. in height and 1.7 mm. in diameter at its base. The walls are often transversely corrugated near the base, as if by the strong contraction of the polyps. The margin is divided into eight evident lobes, often giving an appearance characteristic of the genus Verrucella as originally defined. The tentacles are very thickly encrusted with densely tuberculate spindles forming a mosaic of longitudinally disposed spicules.

A cross section of a branch shows a fairly thick cœnenchyma, large water-vascular canals immersed in the cœnenchyma; and an axis cylinder without horny layers, being composed entirely of limestone and showing concentric markings.

Spicules. The most common form by far is the form that I have called the girdled spindle, and that other writers often call a double spindle. Often the girdle is invaded by the verrucæ, and the result is a terete spindle encircled by close set whorls of verrucæ. Double heads are formed where the two ends of the spicule are rounded in outline. The form which KÖLLIKER calls the "double sphere"[1] is a double head which approaches the form of the girdled spindle, as that term is used in this work. Ordinary spindles with regular whorls of verrucæ are sometimes seen, and when one end is more turgid than the other, a club is formed.

Color. The colony is a deep scarlet; the polyps tinged yellow by the heavy coat of yellow spicules on the tentacles.

This species superficially resembles *Platycaulus* on account of the flattening of the branches. It also resembles *V. granifera* Köll., except in color and measurements of the calyces, *V. granifera* having calyces .8 mm. in height.

3. *Verrucella stellata* new species. (Plate II, figs. 1, 1*a*; Plate X, fig. 3).

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 meters.

Colony subflabellate in form, branching dichotomously, general habit very slender, loose and straggling, 47 cm. in height. The main stem is 4 mm. in diameter, and forks 10.6 cm. above its base. The main branch on one side has five forkings at distances of 3 cm., 3.8 cm., 4.2 cm., 2.7 cm., and 2.8 cm. Or one might regard the main branch as sinuous, bearing five branchlets on its upper surface, all of the branchlets being dichotomously branched from one to four times. The branches are 3 mm. in diameter at their bases, and the ultimate twigs 1.5 mm. in diameter and sometimes attaining a length of 17 cm., the whole colony being much more delicate and slender than either of the other species examined. The cœnenchyma is thin. The calyces are very small scarcely evident verrucæ disposed on all sides of the branches except on proximal portions, where they are scattered or absent. There are none on the stem. There are four rows of calyces, including all sides of the branch which the rows encircle in a poorly marked spiral. There are no evident median bare spaces or grooves, and the calyces are much more distant than in other species of this genus in the collection. They are more sparsely scattered over the front and back than on the sides of the branches.

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[1] Icones Histiologicæ, II, p. 140, Pl. XVIII, fig. 42.

The individual calyces are low, dome-shaped verrucæ with their openings directed outward, not inward nor upward, as in *Juncella*. A typical one measures 1.5 mm. in diameter at the base and about .7 mm. in height. The apertures are star-like owing to the lobed margins below which the tentacle bases form a star-shaped figure, the tentacles themselves being infolded. The polyp bodies are short and stout, and their upper portions bear numerous small spicules transversely disposed. The tentacle bases are encrusted with spicules so as to form a sort of pseudo-operculum in retraction. A cross section of one of the larger branches shows a denser structure of the axis than in *Juncella*, but there is still a very distinct appearance of lamination. The water-vascular canals are very regularly disposed around the axis and a short distance outside of it. In a longitudinal section of a part of a branch round and regular openings are seen in the walls of the primary canals, and these communicate with the body cavities of the polyps.

Spicules. These are quite characteristic of the genus *Verrucella*. The most common forms are small, densely tuberculate double heads, the heads being separated by a narrow girdle. This girdle is often obliterated, forming oval densely tuberculate spindles. True tuberculate clubs are also found, as well as regular spindles. All possible gradations between the heads, clubs and spindles are found.

Color. The colony is a lively coral red throughout.

Genus **Ctenocella** Valenciennes.

Ctenocella Valenciennes. Comptes rendus, XLI, 1855, p. 14.
Ctenocella Milne Edwards et Haime. Hist. Nat. des Coralliaires, 1857, p. 185.
Ctenocella Ridley. Zoological Collections of H. M. S. Alert, 1884, p. 348.
Ctenocella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 68.
Ctenocella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXVI.

The original description of the genus *Ctenocella* is as follows:

"Le sclérobase s'allongeant en baguettes droites et pectinées d'un seul côté de la tige principale".

Milne Edwards and Haime (1857) define the genus as follows:

"Polypieroide s'allongeant en baguettes droites et pectinées d'un seul côté".

Studer (1887) gives an adequate definition of the genus which is freely translated as follows:

"Colony peculiarly pectinate, the twigs springing as unbranched upright switches from the upper sides of the branches. Calyces not prominent, on two sides of the branchlets. An evident median furrow is present (on the branches). The spicules are warty double clubs[1], those of the calyces being, according to Ridley, distinct from those of the cœnenchyma, being longer and with two or three whorls of tubercles. The middle whorl is in the centre of the spicule, so that the middle zone, so characteristic of the spicules of the cœnenchyma, is here absent".

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[1] These spicules would be called "double heads" in the nomenclature adopted in the present work.

This seems to have been the last formal definition of the genus, that of WRIGHT and STUDER in the Challenger Report (1889) being merely a translation of it, and may well stand as a characterization of the genus for our present purposes.

The type, and only known species is *Ctenocella pectinata* (Pallas).

1. *Ctenocella pectinata* (Pallas).

Gorgonia pectinata Pallas. Elenchus Zoophytorum, 1766, p. 179.
Gorgonia pectinata Ellis and Solander. Natural History of Zoophytes, 1786, p. 85.
Gorgonia pectinata Lamouroux. Histoire des Polypiers coralligènes flexibles, 1816, p. 416.
Ctenocella pectinata Valenciennes. Comptes rendus, XLI, 1855, p. 14.
Ctenocella pectinata Milne Edwards et Haime. Histoire Naturelle des Coralliaires, 1857, p. 185.
Ctenocella pectinata Gray. Catalogue Lithophytes in the Collections of the British Museum, 1870, p. 26.
Gorgonella pectinata Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Ctenocella pectinata Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 657.
Ctenocella pectinata Studer. Versuch eines Systemes der Alcyonarien, 1887, p. 68.
Ctenocella pectinata Saville Kent. Great Barrier Reef of Australia, 1893, p. 200.
Ctenocella pectinata Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 119.

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters.
Stat. 299. 10° 52'.4 S., 123° 1'.1 E. Cyrus Bay, Rotti Island. 34 meters.
*Dutch South New Guinea. Dr. J. W. R. KOCH leg. 1904.

Like many other well known and striking forms this species seems not to have received detailed description.

Colony 21 cm. high and with a spread of 37.5 cm. The main stem is 2 cm. long and with a diameter of 5 mm. The main branches into which the stem forks extend almost horizontally outward proximally and then curve gradually upward in their distal portions. They have a basal diameter of 4 mm. and the longest one is 22.5 cm. in length. The branchlets are erect, strictly unilateral, parallel and usually simple. Occasionally, however, they are forked, and the proximal one on each branch bears ultimate branchlets which are also erect and parallel. The branchlets have an average diameter of about 2.3 mm., are closely set, regularly spaced and average about 4 to 5 mm. apart. The longest one is 14 cm. long. There are 33 branchlets on one branch and 34 on the other.

The median bare space is not well marked on the front and back of the branches, the calyces being distributed on all sides but more sparsely on the front.

The idividual calyces are very low verrucæ, often practically obsolete, and their openings are often so tightly closed as to be invisible. When not closed they are seen to be not at the summit of the verrucæ but exentric and often lateral, opening toward the side of the calyx, or inclined distally. The calyces are small, and so low that their dimensions can not well be ascertained on account of there being no line of demarcation between their walls and the general surface of the cœnenchyma. Another specimen, from Station 299, has more prominent verrucæ, a typical one measuring 1.2 mm. in height and 1.5 mm. in diameter at base. It is papilliform, inclined distally and has a terminal aperture. The polyps are very small and have a few spicules on the their upper parts, included the tentacle bases.

Spicules. These are nearly all very compact double heads densely covered and with a very narrow girdle. There are also many stout spindles approaching an oval form and without any girdle. A few clubs are seen and an occassional small slender spindle probably from the polyps.

Color. The specimen described is a dull, dark red. Others are a creamy white, the species being apparently dichromatic.

General distribution. This species is widely distributed in the Indian Ocean and the East Indian region in general, Chinese Seas, and Australian region.

The largest specimen of this species in the collection is from Station 273. It is one meter in diameter and creamy white in color.

Genus **Juncella** Valenciennes.

Juncella (in part) Valenciennes. Comptes rendus a l'Acad. Paris, XLI, p. 14.
Juncella Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 186.
Juncella Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Juncella Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 655.
Juncella Versuch eines Systemes der Alcyonaria, 1887, p. 67.
Juncella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXV.
Juncella Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 116.
Juncella Délage et Hérouard. Traité de Zoologie concrète, II, 2, 1901, p. 429.
Juncella Hickson. The Alcyonaria of the Maldives, 1905, p. 818.
Juncella Thomson and Simpson. Alcyonaria of the Indian Ocean, II, 1909, p. 269.

It is very difficult if not quite impossible to distinguish surely between the genera *Scirpearea* and *Juncella* of the earlier writers. The original definition of the genus *Juncella* is as follows:

"A tiges droites en baguettes, couvertes de cellules polypifères éparses sur la sclérobase".

Milne Edwards and Haime (1857) give practically the same definition, somewhat condensed. They include in the genus *Juncella juncea* Val., *J. vimen* Val. (= *Gorgonia Juncea* Ellis and Solander), *J. hystrix* Val., and *J. elongata* (Pallas).

Kölliker (1865) defines the genus as indicated in the following translation:

"Axis with alternating layers of horny and calcareous material. Part of the surface of the stem also pure limestone. Calyces reasonably well developed. Spicules of the cœnenchyma partly warty double heads and partly clubs and double stars .05 to .1 mm. long. Polyp spicules small spindles". This writer includes in the genus *Juncella juncea* (Esper) and *J. gemmacea* (Valenciennes).

Gray (Proceedings Zoological Society of London, 1859) divides the genus into several genera, i. e. *Juncella, Ellisella*, *Vimenella* and ? *Helicella*, a step in which he has not been followed by later writers.

Studer (1878) found that this perplexing group could be divided into two subordinate groups on the basis of the spicules, one group having an outer layer of clubs and an inner layer of double clubs, the other group being characterized by double clubs and spindles. By using this feature and certain characters of the calyces he arrived at a definition of the genus *Juncella* which may be translated as follows:

"Stem simple or dichotomously branched; calyces moderately or strongly exserted, club-shaped. Cœnenchyma thick, with an outer layer of clubs beneath which is a layer of double clubs". This author includes in the genus as thus defined *Juncella juncea* (Pallas), *J. flexilis* Studer, *J. gemmacea* (Valenciennes) and (provisionally) *J. vimen* Val. and *J. ævis* Verrill.

Later (1887) the same writer uses practically the same definition, but adds that the "Calyces are in two lateral rows", a character that does not hold, although repeated by Wright and Studer (1889).

Hickson (1905) discusses the genus at some length and points out clearly the great difficulty in difining the genera of this family. He combines the genera *Juncella* and *Ellisella* of previous writers in the one genus *Juncella*. He would thus include about ten species in the genus. Four of these (*Juncella elongata* Val., *Ellisella calamus* Studer, *E. maculata* Studer, and *Juncella spiralis* Hickson) the present writer would not admit in the genus, using the very characters pointed out by Hickson, i. e. the presence or absence of club-shaped spicules.

Thomson and Simpson (1909) do not attempt to define the genus or to place the large collection of *Juncella* and its allies at their disposal in their proper genera or species. A course which they explain as follows:

"At the same time we refrain from multiplying species without some sound basis of classification. This we hope to supply in a future study".

The present writer, while naturally appalled by a task from which such able authorities shrink, feels that it is possible to make at least some progress in defining this perplexing group, and particularly that the genus *Juncella* itself is capable of being fairly well seperated from allied genera such as *Ellisella* and *Scirpearella*. He therefore suggests the following definition for the genus *Juncella*:

Colony simple or branched, never anastomosing and usually dichotomous when branched. Calyces usually on all sides of the colony, (except in young specimens where they are lateral) often leaving a bare space on two opposite sides of the branches, papillate or club-shaped, inclined distally, capable of partial retraction along with the strongly retracted polyp. Spicules in an outer layer of club-stars with club end beset with distally directed spines underneath which is a thick cœnenchyma with very numerous double heads and double stars. Axis cylinder with concentric layers of horny and calcareous matter.

The type species of this genus is *Juncella juncea* (Pallas). Other known species are *J. barbadensis* Wright and Studer, *J. flagellum* Johnston, *J. flexilis* Studer?, *J. fragilis* Ridley, *J. gemmacea* Valenciennes, *J. racemosa* Wright and Studer, *J. trilineata* Thomson and Herderson, and the new species described beyond.

A number of other forms have been ascribed to this genus, but they are so inadequately discribed as to make it impracticable to locate them properly.

1. *Juncella juncea* (Pallas). (Plate III, figs. 1—4).

Gorgonia juncea Pallas. Elenchus Zoophytorum, 1766, p. 180.
Gorgonia juncea Lamarck. Hist. Nat. Anim. sans Vert., 1816, p. 325.
Gorgonia juncea Ellis and Solander. Natural History of Zoophytes, 1786, p. 81.
Gorgonia juncea Pallas. Characteristic der Thierpflanzen, 1787, p. 226.
Gorgonia juncea Lamouroux. Hist. Polypes coral. flexibles, 1816, p. 419.
Gorgonia juncea Lamarck. Hist. Nat. Anim. sans Vert., 1836, p. 499.
Gorgonia juncea Valenciennes. Comptes rendus, XLI, 1855, p. 14.
Juncella juncea Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 186.
Helicella juncea Gray. Proceedings Zool. Society London, 1857, p. 481.
Juncella juncea Verrill. Bulletin Museum Comparative Zoology, 1864, p. 37.
Juncella juncea Kölliker. Icones Histiologicæ, II, 1865, p. 140.
Juncella juncea Gray. Catalogue Lithophytes Brit. Museum, 1870, p. 25.
Juncella juncea Studer. Monatsbericht der Königl. Akad. der Wissenschaften zu Berlin, 1883, p. 253.
Juncella juncea Ridley. Annals and Magazine of Natural History, Series V, Vol. XI, 1883, p. 253.
Juncella juncea Wright and Studer. Challenger Reports, Alcyonaria, 1889, p. 158.
Juncella gemmacea Wright and Studer. Challenger Reports, Alcyonaria, 1889, p. 158.
Juncella juncea Studer. Alcyonarien aus der Sammlung des Naturhist. Museums in Lübeck, 1894, p. 116.
Juncella juncea Hickson. Alcyonaria of the Maldives, 1905, p. 820.
Juncella juncea Thomson and Henderson. Ceylon Pearl Oyster Report, Alcyonaria, 1905, p. 314.
Juncella juncea Thomson and Crane. Alcyonarians from Okhamandal and Kittiawar, 1909, p. 133.

It is altogether likely that several described forms, where the description was based on young colonies (as was probably the case with several included in the above synonymy), should be included here.

Stat. 50. Bay of Badjo, West coast of Flores. Up to 40 meters.
Stat. 60. Haingsisi, Samau Island near Timor. 23 meters.
Stat. 66. Bank between Islands of Bahuluwang and Tambolungan, south of Saleyer. 8 to 10 meters.
Stat. 162. Between Loslos and Broken Islands, West coast of Salawatti. 18 meters.
Stat. 164. 1°42'.5 S., 130°47'.5 E. Near New Guinea. 32 meters.
Stat. 240. Banda Anchorage. 9 to 45 meters.
Stat. 250. Anchorage off Kilsuin, West coast of Kur Island. 20—45 meters.
Stat. 258. Tual Anchorage, Kei Islands. 22 meters.
Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters.
Stat. 282. 8°25'.2 S., 127°18'.4 E. 27—54 meters.
Stat. 310. 8°30' S., 119°7'.5 E. Flores Sea. 73 meters.
Stat. 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters.

Colony unbranched, 64 cm. long. Axis calcareous, rigid proximally and flexible distally, with a round cross section. There is a median dorsal and ventral line which is free from calyces, narrow but evident. The diameter of the colony is 6.6 mm., and of the axis 3 mm. The calyces are thickly and evenly emplanted on all sides of the colony, except on the narrow median lines. Their arrangement is hard to make out, but they tend toward oblique rows of eight or nine to the row, extending from the dorsal to the ventral median line. The basal portion of the colony is almost bare of calyces. 10 cm. from the base there are about 6 calyces to the row, although almost the greatest diameter of the colony is here attained.

The individual calyces are papillate projections directed distally, but with their adaxial sides appressed to the stem and their mouths turned directly towards the stem, so that they look like fleshy scales with flattened, semicircular free margins. They average about 2.2 mm. long and .8 mm. in diameter. Their distal ends are often somewhat furrowed longitudinally, but this is not constant. There are also often pronounced grooves which are vertical and appear on the sides of the calyces. These are sometimes so pronounced as to give the margin the appearance of being trilobed, the middle lobe being much the largest. The calyx opening proper is entirely concealed in the preserved specimens by being turned directly toward the stem, leaving merely a curved, slit-like opening between the outer calyx wall and the cœnenchyma of the stem. The inner or adaxial wall is very short and thin compared with the outer, and is entirely covered by the latter. The polyps are very small, resembling those of *Isis hippuris*. They are so strongly retracted and so difficult to separate from the mass of small spicules of the fleshy calyx that is is exceedingly difficult to ascertain their characters. The mass of retracted tentacles is bent at an angle with the basal part, the latter being at right angles to the axis and the former inclined toward it. The polyp body has its walls thickly strewn with small oval or lenticular spicules and clubs, the former being probably undeveloped clubs, some of which extend to the dorsal surface of the tentacles.

A section across the stem shows:

1. A layer of club-stars with their club ends directed towards, and forming the surface of the colony.
2. A very thick cœnenchyma filled with similar clubs in the outer portions intergrading with symmetrical double heads and double stars in the inner parts.
3. A series of small round openings of the primary water-vascular canals symmetrically disposed a short distance outside of the axis.
4. The axis cylinder, composed of a series of concentric lamellæ of calcareous matter alternating with horny layers within which is a practically solid core of calcareous matter.

A longitudinal section shows that the polyps communicate with the water-vascular canals by definite round openings rather regularly disposed in the walls of the canals.

Spicules. These are all very minute and symmetrical. Those of the superficial layer of the cœnenchyma are club-stars, showing a distal clavate end truly club-shaped, covered with thorny points directed distally. Below this spiny portion is a perfectly smooth shank of much less diameter. The proximal end of the spicule shows a number of radiating points forming a many-rayed star, or a head with numerous pointed rays symmetrically disposed on all sides. They intergrade with the double stars or double heads which pack the inner portions of the cœnenchyma. These are beautifully symmetrical, minute spicules with a many-rayed head at each end and a median perfectly smooth girdle. The outer spicules are yellow, while the double heads are mostly colorless. Small oval or lenticular spicules are found on the polyp bodies and smaller ones in the tentacles. These intergrade with the club-stars, many of which are found in the polyp walls.

Color. The colony described is a coral red. The exterior of the axis is olive and the interior is white. Spicules yellow and white. Other specimens are yellow.

General distribution. The type locality is the Indian Ocean. It has also been reported, probably erroneously, from the West Indies. It seems to have a wide range in the East Indies.

This species is typically dichromatic, red and yellow colonies of apparently the same age and from the same station being found. Other specimens are nearly white, in alcohol. Still others are salmon color, and some are deep crimson.

A specimen about 5 cm. long from station 164 is found with others much larger. It has the calyces laterally disposed and resembles some of the so-called species described as new by previous writers. This intergrades completely with typical specimens as described above, and from the same station. There seems no doubt that a number of specific descriptions have been based on young specimens.

2. *Juncella gemmacea* (Valenciennes). Plate IV, figs. 1, 1 *a*.

Gorgonia gemmacea Valenciennes. Manuscript in coll. of Museum, Paris, (fide Wright and Studer).
Juncella vimen Valenciennes. Comptes rendus, XLI, 1856, p. 14.
Verrucella gemmacea Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 185.
Juncella gemmacea Kölliker. Icones Histiologicæ, 1865, p. 140.
Ellisella gemmacea Gray. Catalogue Lithophytes British Museum, 1870, p. 26.
Juncella gemmacea Klunzinger. Corallenthiere des Rothen Meeres, I, 1877—79, p. 53.
Juncella gemmacea Studer. Monatsbericht der Königl. Akad. der Wissenschaften zu Berlin, 1878, p. 659.
Juncella gemmacea Ridley. Collection H. M. S. Alert, Alcyonaria, 1884, p. 346.
Juncella gemmacea Wright and Studer, Challenger Reports, the Alcyonaria, 1889, p. 158.
Juncella gemmacea Thomson and Henderson. Ceylon Pearl Oyster Report, Alcyonaria, 1905, p. 313.

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters.
Stat. 299. Lat. 10° 52'.4 S., 123° 1'.1 E. 34 meters.

Colony subflabellate in form, attaining a height of 25.5 cm. The first forking occurs 4.5 cm. above the base. Each of the resulting branches forks about 3.5 cm. above its origin. The whole colony is regularly dichotomous in its branching, branchings of the 10th order being attained. The average distance between forkings is perhaps 2 cm., although there is considerable variation in this respect. As in many other cases of dichotomous branching it is possible to regard the branchlets as all springing from one side of a sinuous branch. This is true in some but not all of the branches. The writer thinks it possible that *Juncella racemosa* Wright and Studer (Challenger Report, p. 159) is this species, and that these authors have taken this view of what I believe to be dichotomous branching.

The basal part of the stem is devoid of cœnenchyma, the axis being 3.2 mm. in diameter. The largest branch is nearly round in section and 4.5 mm. in diameter. This diameter is fairly well maintained throughout the median portions of the colony. In general there is a tendency to a flattening of the branches, although this is due more to the median grooves, which extend in the mid-anterior and mid-posterior surfaces of all of the branches, than to any real flattening of the branches. The terminal twigs are from 2.8 cm. to 7 cm. in length. The calyces are evenly and thickly distributed on all sides of the branches except along the narrow but evident median lines, resembling in their distribution those of species of *Eunicea*, for instance; being so closely packed as to be usually contiguous. In some places they show a strong tendency to an arrangement in spirals or oblique rows. On twigs they are arranged in oblique rows of three or four on each side.

The individual calyces are stout club-shaped, with their distal swollen portions abruptly bent toward the branch and their apertures facing the latter. A typical one measures a trifle over 2 mm. in height and 1.3 mm. in its greatest diameter. The adcauline wall is less than 1 mm. in height. In lateral view a slight appearance of lobulation of the margins is seen. The tentacles are armed with small club-shaped spicules.

A cross section of the axis shows much the same features as in *J. juncea*, except that there is a less symmetrical and regular alternation of calcareous and horny rings, the appearance being more like that of the outer portions of the axis of *Plexaurella.*

Spicules. These are mainly of two sorts, which however intergrade. 1st a double headed spicule with one head like a many-rayed star and the other oval or almost equally round, but with distally directed imbricating spines. These intergrade completely with typical double stars, much less numerous than the double heads.

Color. The colony is a light tan, or yellowish brown.

General distribution. The type locality is the Red Sea. Also reported from Ceylon and the Indian Ocean.

3. *Juncella racemosa* Wright and Studer.

Juncella racemosa Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 159.
Juncella racemosa Thomson and Simpson. Alcyonaria of the Indian Ocean, II, 1909, p. 268.

Stat. 99. 6° 7′.5 N., 120° 26′ E. 16—23 meters.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 meters.
Stat. 258. Tual Anchorage, Kei Islands. 22 meters.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 meters.
Stat. 310. 8° 30′ S., 119° 71′.5 E. 73 meters.

Colony subflabellate, straggling in habit, 38 cm. in height, branching dichotomously. The first forking is 7 cm. above the base. The main stem is mostly decorticated and has a diameter of 3,3 mm. The branches are dichotomous, or unilateral according to interpretation [1], branchings of the fifth order being sometimes attained. The distance between branches varies from 5.5 cm. to 3.5 cm. thus averaging much more than in the preceding species. The terminal twigs are much longer, reaching a length of 16 cm. The diameter of the branches varies from 3 mm. to 2 mm. near tips of branches. The median grooves are evident on the proximal parts of the colony, but are almost obliterated on the distal parts. The calyces are emplanted on all sides of the branches, and are in oblique rows of 3 to 5, although the rows are often obscured by younger calyces being intercalated between the older and larger ones. In some places the calyces on one side of the branch are inclined upward, while those on the other side are inclined downward; but this is exceptional.

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[1] It seems to the writer that there is much confusion over this point. He would call the branching unilateral when the main branch is straight (not undulating) and bears branchlets on one side only. When the main branch is regularly undulating and sends forth branches from the knees of the undulations the branching is dichotomous.

As a good illustration of the former *Ctenocella* may be cited, while the present species is an excellent illustration of the latter.

The individual calyces are club-shaped, prominent, with their distal ends enlarged and inclined toward the branch. The aperture seems in general to be more strictly terminal than in other species and less inclined to face the branch. This, however, may be largely due to the stage of contraction of the polyp. A typical calyx measures 1.6 mm. in length and 1.2 mm. in diameter. There is a slight appearance of lobulation around the margin. The dorsal surfaces of the tentacles are armed with small, often bar-like spindles transversely disposed.

A cross section of a branch shows that the cœnenchyma is rather thick and the axis is composed of many concentric and interrupted rings of calcareous and horny material alternately disposed. The water-vascular canals are symmetrically disposed arround the axis, but some distance outside of it.

Spicules. These are of two kinds characteristic of the genus. The club-stars have the club ends more slender, as a rule, than in the last species, and simple clubs are rather common. Typical double stars are rare. Double crosses are also found, as well as an occasional simple spindle.

Color. The colony is a bright coral red throughout. The polyps are white.

General distribution. Type locality off Japan, 345 fathoms. This species is also found in the Indian Ocean.

The specimens referred to this species are identified with some doubt, but the one described agrees fairly well with the original description, particularly as regards spiculation, manner of growth and the calyces.

Thomson and Simpson regard *Juncella miniacea* as a synonym for this species.

4. *Jucella sanguinea* new species (Plate V, figs. 1, 1 *a*; Plate X, fig. 4).

Stat. 258. Tual Anchorage, Kei Islands. 22 meters.
Stat. 299. 10° 52'.4 S., 123° 1'.1 E. 34 meters.

Colony (incomplete) subflabellate in form and attaining a height of 37.5 cm. The specimen consists apparently of one of the main branches of a much larger colony. The branching is partly dichotomous and partly irregular. The main stem, or branch, is 4 mm. in diameter and its first forking is 3.5 cm. above its base. The resultant branches are quite irregular, the smaller one giving off branchlets from the outer side only, while the larger one is dichotomously branched. The distance between branchings is from 6.8 cm. to 9 mm. (on distal parts). The polyps are regularly and thickly emplanted on all sides of the branches, there being but a slight indication of median grooves on the anterior and posterior surfaces; but more thickly on the distal than on the proximal parts of the colony. They are arranged in somewhat irregular diagonal rows of about four to each row, reaching from back to front of the colony.

The individual calyces are much as in the last species, being club-shaped with their openings turned toward the branch and often pressed against it. A typical calyx measure 2.8 mm. in height and 1.3 mm. in greatest diameter. The adcauline wall is about 1.3 mm. long, the calyx being less extensively appressed to the branch than in *J. gemmacea.* The oral end shows a small central aperture surrounded by eight rather shallow lobes. I am unable to detect any spicules on the tentacles.

A cross section of the axis near the base shows a distinct difference from other species of the genus examined. There is no central core of homogenious consistency, but the whole axis is made up of interwoven calcareous and horny material, very much as is represented by KÖLLIKER in his figure of the axis of *J. gemmacea*[1].

Spicules. These are much as in the last species, being almost exclusively of two types, the most common being double heads or rather club-stars according to the nomenclature adopted in this work. The second form is a typical double star. I can find no true spindles except some very minute ones which I suppose to be young spicules.

Color. The colony is deep crimson throughout. The axis has an olive green cast and the polyps are white.

This species is closely allied to *J. gemmacea.* It differs, however, in being more robust in habit, in the size and shape of the calyces, in having no tentacular spicules, and in color. This last character, however, would not, alone, be a sufficient one to justify us in regarding it as distinct. It differs from *J. racemosa* in size of calyces and in the character of the spicules.

Note on the genus **Scirpearea**.

The writer has already (p. 5) given his reasons for regarding this genus untenable. He is further of the opinion that the species heretofore included in *Scirpearea* could be acommodated in other genera. Some of these species could be placed in *Juncella*, and such species as *Scirpearea furcata* Hickson[2] could go into the genus *Scirpearella* as defined by WRIGHT and STUDER.

Genus **Scirpearella** Wright and Studer.

Scirpearella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 154.
Scirpearella Délage et Hérouard. Traité de Zoologie Concrète, Tome II, 2me Partie, 1901, p. 429.

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[1] Icones Histiologicæ, II, 1865, plate XIV, fig. 4.

[2] Alcyonaria of the Maldives, II, 1905, p. 822.

The original definition of this genus is as follows:

"Colony simple or very feebly branched. Axis calcareous, brittle, smooth or symmetrically grooved on the surface. Polyps arranged in spirals or sometimes in rows on the stem; tentacles and upper portion of the polyps retractile within prominent verrucæ. Cœnenchyma moderately thick, with spiny spindles and double clubs forming a roughened outer layer".

The mode of branching does not seem to be a good generic character in this group, and is not available for this genus. The spicules, according to the figures given by WRIGHT and STUDER (Plate XXXIV, figs. 5, 6, 7 and 8) are seldom true double clubs. This is also true of the species in the Siboga collection. The forms called "double clubs" by WRIGHT and STUDER would be called double heads by the present writer who would define the genus as follows:

Gorgonellidæ which are variously branched, but in no known case reticulate. Calyces arranged in spirals or oblique rows in adult colonies, but opposite in young colonies, low verrucæ or domes capable of retracting with the polyps. Spicules mostly double heads and girdled spindles, but simple spindles and a few clubs are also found.

The type of this species is *Scirpearella profunda* Wright and Studer. Other known species are *Scirpearella aurantiaca* Thomson and Henderson, *S. divisa* Thomson and Henderson, *S. gracilis* Wright and Studer, *S. indica* Hickson, *S. moniliformis* Wright and Studer, *S. rubra* Wright and Studer, *S.* (*Scirpearea*) *furcata* (Hickson) and the new species described beyond.

1. *Scirpearella rubra* Wright and Studer (Plate VI, figs. 1—5).

Scirpearella rubra Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 157.

Stat. 60. Haingsisi, Samau Island near Timor. 23 meters.
Stat. 80. 2° 25′ S., 117° 43′ E. 50—40 meters.
Stat. 91. Muaras Reef, inner side, East coast of Borneo. Up to 54 meters.
Stat. 133. Anchorage off Lirung, Salibabu Island. Up to 36 meters.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 meters.
Stat. 204. 4° 20′ S., 122° 58′ E. From 75 to 94 meters.
Stat. 240. Banda Anchorage. 9—45 meters.
Stat. 258. Tual Anchorage, Kei Islands. 22 meters.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 meters.
Stat. 305. Mid Channel in Solor Strait, off Kampong Menanga. 113 meters.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 meters.

Colony an unbranched stem (incomplete) 125 cm. long. Diameter near proximal end 6 mm., near distal end 4 mm., near middle 7 mm. The calyces are arranged in more or less regular spirals around all sides of the stem, there being usually from seven to ten calyces in a spiral, a little more than 2 mm. apart on the average. Proximally they are much more distant, distally somewhat more closely approximated. Near the distal end one side of the colony shows a rather broad bare band, but this is not evident on most of the stem. On the proximal part there is a tendency to show two such bands, frequently invaded however, on opposite sides of the colony.

The individual calyces are in the shape of a reversed horn or curved cone, the summit being curved upward and the opening being directed upward, or upward and a little outward. A typical calyx measures 2.7 mm. in height and 2.8 mm. in diameter at base. Near the distal end it has a diameter of 1.4 mm. and the walls on the distal portion show faint indications of eight streaks of reddish against the lighter distal parts of the wall. The walls are crowded with vertically disposed spicules, most of which seem to be tuberculate spindles. The dorsal surfaces of the tentacles bear transversely disposed spindles. There are also short stout spindles in the lower portion of the mesenteries, usually vertically placed. Very large ova were found attached to four of the mesenterial filaments.

A cross section of the stem shows a moderately thick cœnenchyma. The axis cylinder is much like that of *Juncella*, with a comparatively dense core showing but slight evidence of concentric lamellation, and an outer envelope composed of concentric layers of horny and calcareous matter. The water-vascular canals are regularly disposed around the axis and their walls are filled with stout double clubs.

Spicules. By far the most common form is the densely tuberculate double head. Occasionally these take the form of very stout crosses through longitudinal division of the heads. The next most common form is the regular spindle, found mainly in the polyps themselves. Sometimes these have regular whorls of verrucæ, but they are usually stout, with irregularly disposed warts. Clubs are rarely seen.

Color. The colony is coral red, as are also the polyps. Other colonies are creamy white.

General distribution. Type locality. Hyalonema Ground, off Japan, 345 fathoms.

A large series of this species makes it possible to determine that the young specimens may be of either color. In these the calyces are lateral and usually opposite.

These intergrade with typical colonies, sometimes from the same station. Several specimens are slightly branched.

2. *Scirpearella gracilis* Wright and Studer. (Plate VII, figs. 1—5).

Scirpearella gracilis Wright and Studer. Challenger Report, the Alcyonaria, 1889, p. 156.

Stat. 58. Bay of Nangamessi, Sumba. Up to 36 meters.
Stat. 166. 2° 28'.5 S., 131° 3'.3 E. 118 meters.
Stat. 204. 4° 20' S., 122° 58' E. 75—90 meters.
? Stat. 208. 5° 39' S., 122° 12' E. 1886 meters.
Stat. 260. 5° 36'.5 S., 132° 55'.2 E. 90 meters.
Stat. 274. 5° 28'.2 S., 134° 53'.9 E. 57 meters.
Stat. 289. 9° 0'.3 S., 126° 24'.5 E. 112 meters.

Colony originally forked, but with one branch missing. 44.5 cm. in length. Main stem to fork 4.4 cm. long, 3.5 mm. in diameter, and devoid of calyces. Main branch devoid of calyces for 13.5 cm., 3.5 mm. in diameter near base and diminishing to 3 mm. near distal end. There is a shallow but distinct groove running along one side of the colony, and that side is less thickly emplanted with calyces than the other and there is a distinct tendency toward a bare band on either side of the groove. The calyces are thus on three sides of the stem, where they often tend to a spiral arrangement, there being usually four calyces in each oblique row from the impressed line on one side around to the one on the other. On the distal part of the colony there are two opposite grooves, each in the centre of a distinct band devoid of calyces. Here there is a double row of calyces on each side. Another fragment in the same bottle appears to be the distal end of the branch just described. It is 32 cm. long. It is therefore probable that this colony was originally 76.5 cm. long, tapering to a very fine, slender end.

The individual calyces are subconical or rather truncated cones, rather low and broad. A typical one measures 1 mm. in height and 1.9 mm. in diameter at the base. The tentacles bear spicules, mostly double spindles, thickly encrusted over their basal portions.

Spicules. These are almost exclusively double heads and girdled spindles (double spindles?) They are all densely tuberculate. Heavy fusiform spicules are formed when the depressed girdles are obliterated by the invasion of tubercles. The double heads and girdled spindles intergrade in every possible degree. Regular spindles, such as are common in *S. rubra*, are almost never seen. Small crosses formed of four tuberculate heads joined by a cross-shaped smoother part, are rather common, the four heads being so close as to be often contiguous. I find no clubs.

Color. The colony is light grayish brown throughout, with a tinge of olive.

General distribution. Type locality. Off New Hebrides. 130 fathoms.

A young specimen from station 289 is 22.5 cm. long, very slender, with a length of 9 mm. without calyces, and 15 mm. with calyces. The calyces are lateral and regularly alternate, averaging about 2.3 mm. apart. In form they are low cones with rounded summits which are directed outward. The spicules are as in the specimen described above. Another specimen from the same station has lateral calyces which appear much more prominent on account of the partial expansion of the polyps. It also shows a faint median impressed line. A specimen taken from station 208, depth 1886 meters agrees quite well with young specimens from station 260 (90 meters) and 204 (94 meters).

It is altogether likely that some of the so-called species of this genus that have been described as specifically distinct and are listed on page 24 are based on young specimens of this form.

3. *Scirpearella regia* new species. (Plate VIII, figs. 1, 1 *a*; Plate X, fig. 5).

Stat. 172. Gisser; anchorage between this Island and Ceram-Laut. 18 meters.

Colony (dried) an enormous bushy mass profusely branched in a dichotomous manner, 134 cm. in height. The base is a rudely hemispherical mass embracing corallines, wormtubes etc., 19 cm. in diameter and 8 cm. high. The stem is 2.1 cm. in diameter at its base, bears a stub of a branch 4 cm. from its proximal end and bifurcates about 12 cm. from its base. The main branches bifurcate 10.5 cm. above their origin and continue to divide dichotomously until branchings of the 8th order are attained. The ultimate twigs are very long and slender, sometimes 60 cm. long, with an average diameter of 3.5 mm. The branches and twigs are all erect and proximately parallel, and are very numerous, there being considerably over 100. The cœnenchyma is thin, and the main branches are without calyces and often denuded of cœnenchyma. The calyces are distributed on all sides of the smaller branches and twigs. There is no evidence of a median groove in the dried specimen, and the calyces are so shrunken in the type that they can not be studied in a satisfactory manner. At the distal ends of the twigs the cœnenchyma is so shrunken that a cross section is sometimes triangular and sometimes quadrangular.

A cross section of a small branch shows a rather thin cœnenchyma, regularly disposed primary water-vascular canals and axis with a hard amorphous core of limestone and an outer relatively thick investment of concentric layers of partly calcareous and partly horny material.

Spicules. These are mostly densely tuberculated double heads with the girdle usually quite well marked and seldom entirely obliterated. These intergrade with girdled spindles, double crosses, etc. Regular Greek crosses are also seen, but the most common form, next to the double head, is the double cross. Simple spindles and clubs are rarely seen.

Color. The dried colony is a rather light reddish brown or terra cotta. It was probably bright red in life. The spicules are an orange yellow.

This is by far the largest gorgonellid in the collection, and must have been a truly magnificent specimen when alive.

4. *Scirpearella hemispherica* new species. (Plate V, figs. 2 and 2*a*; Plate X, fig. 6).

Stat. 60. Haingsisi, Samau Island near Timor. 23 meters.

Colony unbranched, 18 cm. in height. The basal part of the stem is devoid of calyces and is 2.2 cm. in diameter. 5 cm. from its base the colony seems to have been forked and one of the braches broken off short. Above this point the stem is bare for 2.6 cm., and but 1.2 mm. in diameter across the polypiferous portion. The calyces are very irregularly but rather closely scattered on all sides of the stem with a tendency toward a more compact arrangement on the sides.

The individual calyces are regularly hemispherical or dome-shaped, varying greatly in size. One of the larger ones is 1.7 mm. in height and 2.3 mm. in diameter at its base. They are so completely closed by the strong contraction of the polyps that the openings are seen with difficulty, but appear to be somewhat inclined toward the distal end of the colony. The distal end of the polyp body is filled with a mosaic of spicules in the form of double heads and double spindles, and these run out over the basal portions of the tentacles in broad bands which appear conspicuously on the tentacles after the polyp has been dissected away from the calyx, the red spicules contrasting with the yellowish polyp.

Spicules. Practically all of the spicules are very densely tuberculated double heads with the girdles very narrow and often obliterated so as to produce an oval form compactly covered with very closely aggregated verrucæ. Spindles are very rarely seen, and these are probably from the polyps.

Color. The colony is coral red, the part of the stem which bears no calyces is dull pink. The axis is light yellowish and the polyps yellow.

This species appears to be clearly distinct from the others in the collection, and I am unable to identify it with any of the described forms. The shape of the calyces, although often not very reliable specific characters, seems to be quite characteristic in this case. The spiculation of the polyps also furnishes a good character. It is probably nearest *S. gracilis*; but that species seems constant is color, no red specimens having been found.

Genus **Nicella** Gray.

Nicella Gray. Catalogue Lithophytes in the British Museum, 1870, p. 40.
Nicella Studer. Versuch eines Systemes der Alcyonarien, 1887, p. 67.
Nicella Wright and Studer. Challenger Reports, the Alcyonaria, 2889, p. LXV.

STUDER (1887) gives the only satisfactory definition of this genus that I have been able to find. The following is a translation:

"Stem upright, branched, with thin cœnenchyma and exserted calyces which stand vertically and have their ends truncated. Calyces lateral on stem and branches, leaving a median space bare. The spicules form an outer layer of small double clubs and an inner layer of longer cylindrical or spindle forms, thickly covered with verrucae".

WRIGHT and STUDER (1889) give practically the same definition as the one quoted above.

With the single change of the words "double clubs" to "double heads" the definition as given by STUDER can stand as acceptible for our present purpose.

The type of this genus appears to be *Nicella dichotoma* (Gray)[1]. But two other species of the genus seem to have been described, i. e. *Nicella pustulosa* and *N. reticulata*, both by THOMSON and SIMPSON. It seems, however, from the descriptions and figures, that neither of these species can be regarded as belonging to this genus as defined by STUDER.

1. *Nicella coralloides* new species. (Plate IX, figs. 2, 2*a*; Plate XI, fig. 1).

Stat. 117. 1°0'.5 N., 122°56' E. 80 meters.
Stat. 257. Duroa Strait, Kei Islands. Up to 52 meters.

Colony flabellate in form, 11 cm. in height and with a spread of 9.5 cm. The base is wanting, and also one large branch. The main stem is 1.8 cm. long to where it forks, and one of the resultant branches is broken off. Diameter of stem about 2 mm. The main branch is curved in the shape of a sickle and sends off a number of secondary branches which again divide in an irregularly alternate manner and often fork distally, the ultimate branchlets being short, rarely exceeding 1.5 cm. in length. The distance between secondary branches averages about 5 mm. There is no evident keel or groove in the median line, although it is indicated in places. The calyces are lateral and alternate in position, and are usually about 1.5 mm. apart.

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[1] This species, according to WRIGHT and STUDER, was originally named *Scirpearea dichotoma* Gray and afterward changed by the original describer to *Nicella mauritiana* Gray. This proceeding would not be considered allowable under our present rules of nomenclature, and therefore the species should, in my opinion, be *Nicella dichotoma* (Gray).

The individual calyces are cylindrical in form and are projected nearly at a right angle with the branch, although they tend to be distally inclined. A typical calyx measures 1.3 mm. in height and 1.1 mm. in diameter. The basal end is usually somewhat broader than the distal. The margin is surrounded by eight lobes which are continuous with the bases of the tentacles. These lobes are not so distinct as in the next species.

The tentacles are very thickly encrusted with a mosaic of bar-like spicules, and similar spicules are placed vertically in the body wall of the polyp.

A cross section of a branch shows a relatively thin cœnenchyma and a regular series of water-vascular canals which, in a large branch, is separated from the axis by a thin layer of cœnenchyma. The axis is calcareous, without lamellæ of horny material.

Spicules. As in the next species, these are of two kinds, an outer layer of small double heads and an inner layer of much larger bar-like forms with rounded corners and a densely and finely tuberculate surface. This species differs from the next, however, in having the girdles almost always obliterated in these bar-like forms, although it is occasionally seen in what are probably immature spicules.

The double heads sometimes become double stars, and the bar-like forms sometimes intergrade with slender spindles.

Color. The colony is a bright coral red; the polyps are white, but may originally have been yellow. The axis is greenish.

Other specimens from the type locality have verruciform calyces. This is probably due to the fact that the calyces partake of the retraction of the polyps. Another specimen is very large, broken, the largest fragment being 25 cm. long.

2. *Nicella carinata* new species. (Plate IX, figs. 1, 1 *a*; Pl. XI, fig. 2).

Stat. 117. 1°0'.5 N. 122°56' E., 80 meters. (Type).
Stat. 154. 0°7'.2 N., 130°25'.5 E. 83 meters.
Stat. 213. Saleyer Anchorage and surroundings, including Pulu Pasi Tanette, near the North point of Saleyer Island. Up to 36 meters.
Stat. 257. In Duroa Strait, Kei Islands. Up to 52 meters. (Type).
Stat. 260. 5°36'.5 S., 132°55'.2 E. 90 meters.
Stat. 305. Mid Channel in Solor Straits, off Kampong Menanga. 113 meters.

Colony very profusely branching, irregular in form, but tending to form a sub-flabellate structure. The base is absent, and the main stem is branched about 7.5 cm. from its proximal end. It is about 3.1 cm. in diameter, round in section and ascends in a feebly geniculate manner giving off branches alternately to the right and left. These branches are sometimes fairly straight and at others tortuous, and give off branchlets which tend to an alternate arrangement and rebranch until branchings of the 6th order are sometimes attained. The front and back of the branches are devoid of calyces and often show a median longitudinal ridge or keel. The distance between branches varies greatly, but will average perhaps 8 mm. The tips of the twigs bear a pair of nearly opposite calyces with a blunt point between them indicating the end of the axis. Calyces regularly alternate.

The individual calyces are quite prominent for this group, cylindrical in form and regularly alternate in position. They are directed outward, upward and slightly forward or toward the front of the colony. A typical calyx measures 1.6 mm. in height and 1.3 mm. in diameter. They are often slightly longer in the distal parts of the colony. The walls show a tendency to form eight longitudinal ridges or corrugations on the distal parts. The margin is eight-lobed and the bases of the infolded tentacles are very prominent, forming a radiate mass, the intervals between the tentacles showing as a star-like figure. The tentacle bases are heavily spiculated, mostly with double heads similar to those on the calyx walls and general cœnenchyma. They encrust the dorsal surface of the tentacles well to the distal end. The cœnenchyma is rather thin and the axis is calcareous without evident lamellæ of chitinous matter.

Spicules. These are very characteristic and consist mainly of two forms; 1st an outer layer of minute double heads, densely tuberculate; 2nd an inner and thicker layer of spicules which differs from any others that I have seen aside from this genus. They are much larger than the double heads, and bar-like in outline. The bars are somewhat narrowed at the ends and have their corners rounded, although the ends are fairly square. Their surface is very finely and densely tuberculate, so that the actual surface of the spicule is almost completely hidden except for the median girdle which is usually sharply cut but sometimes obscured or completely obliterated. Almost all of the spicules are one or the other of these two forms. Rarely minute crosses are seen and very rarely minute regular spindles.

Color. The colony in general is yellowish golden brown; the polyps very dark brown or chocolate, a most unusual color, which is quite conspicuous when the polyps are dissected out. None were expanded in the specimen described.

This species is a typical *Nicella* according to the original definition by Gray, and demonstrates the validity of the genus.

In a specimen from Station 257 the calyces are more crowded and proportionally shorter, and grayish in color, as if bleached. A small specimen from station 260 has the calyces much more distant than in the type, and is grayish brown in color.

Genus **Ellisella** Gray (modified by Studer).

Ellisella Gray. Proceedings Zoological Society of London, 1857, p. 257.
Ellisella Gray. Catalogue Lithophytes British Museum, 1870, p. 25.
Ellisella Studer. Monatsbericht der Königl. Akademie der Wissenschaft. zu Berlin, 1878, p. 659.
Ellisella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 68.
Ellisella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXVI.

STUDER (1878) defines the genus as follows:

"Stamm einfach oder gabelästig, Warzen kaum vorspringend, in zwei Reihen seitlich am Stamm angeordnet. In der Rinde nur dopple Keulen und Spindeln".

The same author (1887) gives a slightly extended definition, translated as follows:

"Colony simple, or with forked branches, thick cœnenchyma and scarcely developed calyces which are arranged in two rows. Cœnenchyma contains double clubs and spindles".

This definition is practically repeated by WRIGHT and STUDER (1889) since which time it has apparently received no further definition. STUDER's last definition may therefore stand as the one here adopted, with the understanding that the "Dopple Keulen" of that writer be interpreted as "double heads" according to the system here used.

The type of this genus appears to be *Ellisella elongata* (Pallas). Other species are *Ellisella calamus* Studer, *E. maculata* Studer, and the single species secured by the Siboga Expedition.

1. *Ellisella flava* new species (Plate IX, fig. 4, 4*a*; Plate XI, fig. 3).

Stat. 117. 1°0'.5 N., 122°56' E. 80 meters.

Colony fragmentary, the largest piece being 6.5 cm. long, dichotomously branched twice, the first forking being immediately above the proximal end of the specimen. One of the resultant branches is simple and is 4.1 cm. long. The other branch forks 3.7 mm. above its origin, the resulting branchlets being simple, the longer 2.6 mm. and the shorter 1.4 cm. long. The branches are slender with a comparatively uniform diameter of .7 mm. There is a clearly defined furrow along the front of the branches. The calyces are disposed on two opposite sides of the branches, in some places being regularly opposite in position and in others being irregular. The former, however, seems to be the normal arrangement.

The individual calyces are very low subconical verrucæ appearing as mere swellings along the sides of the branches. A typical calyx measures 1.1 mm. in its longer diameter (being oval in section) and .6 mm. in height. The margin is feebly marked with eight lobes. The calyx walls are filled with regular spindles which are vertically disposed on the distal parts and point toward the margin. Similar spindles encircle the basal parts and are longitudinally disposed in the cœnenchyma of the branches. The tentacle bases are thickly encrusted with smaller spindles disposed longitudinally, as a rule. On the distal parts of the tentacles there is a dorsal band of small transverse spindles.

The cœnenchyma is comparatively thin and the axis is hard, white and calcareous.

Spicules. The spicules of this form do not have the general facies of the spicules of the Gorgonellidæ at all. The most common form by far is the tuberculate spindle, terete in form and almost never with a distinct girdle. The tuberculation is usually quite dense, so as to hide the actual surface of the spicule. There are also a few clubs, crosses, small irregularly branched forms and, very rarely, double heads.

Color. The colony, in alcohol, is rather bright yellow.

Were it not for the calcareous axis, without joints, the writer would hardly suspect this species of belonging to the Gorgonellidæ. It seems to fit better in the genus *Ellisella* than in any other, although the practical absence of double clubs is not in accord with the definition adopted for that genus.

Genus **Plumigorgia** new genus.

Colony bearing symmetrically disposed, delicate, pinnately arranged ultimate branchlets, greatly resembling a plumularian hydroid. Calyces minute. Spicules very minute, oval lenticular and disk-shaped forms embedded in a translucent horn-like cœnenchyma from which it is difficult to separate the spicules.

1. *Plumigorgia hydroides* new species. (Plate IX, fig. 3, 3 *a*; Plate XI, fig. 4).

Stat. 96. Southeast side of Pearl Bank, Sulu Archipelago. 15 meters.
Stat. 123. North Bay, Biaru Island. 36—27 meters. (Type).

Colony straggling in form, branches truly pinnate, greatly resembling a plumularian hydroid; total height 13.7 cm. The colony arises from an irregularly calcareous mass. The main stem is 2 mm. in diameter near its base and forks 2.8 mm. above its origin. The main branches are stiff and tortuous, most of their branchlets being broken off, but their stubs show that they were rather regularly alternate, at least on the distal parts of the colony. The ultimate branchlets are regularly alternate offshoots from the secondary branches, and are gracefully curved exactly as are the hydrocladia in a plumularian. The ultimate twigs are about 3.5 mm. apart and attain a length of 13 mm. The axis in these branchlets is exceedingly attenuated, being at the ends no larger than a hair, and is calcareous throughout. The calyces are all lateral, but are otherwise irregularly disposed, being opposite, subopposite or alternate in different parts of the same twig.

The individual calyces are very minute for alcyonarians, a typical one being less than .5 mm. in height and about as wide as high. They vary in shape, some being dome-shaped and others in the form of short cylinders. Their walls are full of minute disk-shaped or biscuit-shaped spicules. These are embedded in the cœnenchyma in a peculiar manner, not being contiguous, but distinctly spaced as if stuck in a horn-like translucent cœnenchyma, each spicule being distinctly isolated from its fellows. This horn-like matrix is peculiar in that it resists boiling in a potash solution and comes off from the axis like a transparent pellicle with the spicules still firmly embedded. An end view of a calyx shows that the aperture is very small, when the polyp is retracted, and the margin is surrounded by eight not very strongly marked lobes. The tentacles have very long and slender pinnules and their dorsal surfaces are packed with minute disk-like spicules which are even smaller than those in the calyx walls and cœnenchyma.

Spicules. These are of two forms which are really but modifications of one. They are all lenticular or disk-shaped. Often the oval is constricted in the middle and thus a biscuit form is produced. Their surfaces are all covered with fine granules which are much smaller than verrucæ. None of them are girdled and the granules are so thick that the spicules are not translucent.

Color. The whole colony is creamy white.

A number of specimens from Station 96 were preserved in formalin and the spicules were exceedingly hard to demonstrate. A few, however, were found and proved to be of the same peculiar forms as described above.

Genus **Isidoides** new genus.

Axis solidly calcareous; calyces club-shaped; spicules comparatively large bar-like forms with the ends swollen and the surface comparatively smooth, without evident verrucæ. The operculum is composed of eight segments, each consisting of a plate formed of adherent longitudinally disposed bars.

1. *Isidoides armata* new species. (Plate VIII, figs. 2, 2*a*; Plate XI, fig. 5).

Stat. 267. 5° 54′ S., 132° 56′.7 E. 984 meters.

The specimen is fragmentary, the largest fragment being straggling in form, 15 cm. high and with the base lacking; although it is partly retained in another, where it is solidly calcareous. The main stem, or branch, forks 5 cm. from its base, one of the resulting branches being broken off 3 cm. from its base and the other forming practically the entire specimen. This latter is denuded to its first lateral branchlet 4.4 cm. from its origin. 1.1 cm. above this branchlet another arises on the same side which forms the main part of the specimen and is about 8.6 cm. long. It bears one terminal simple twig on one side and two on the other. The axis is solidly calcareous, round, 1.5 mm. thick at its base. The calyces are almost all lateral in position on the main branches, but may be on all sides of the distal parts of the twigs. They are irregular in distribution, averaging about 2 mm. apart.

The individual calyces vary greatly in size and shape according to age and stage of contraction of the polyps. Ordinarily they are tubular when retracted and club-shaped when expanded, but the distal ends are almost always enlarged, even in retraction. A typical calyx with retracted polyp measures 1.8 mm. in height and 1.4 mm. in diameter near its distal end. One with the polyp partly expanded is 4 mm. high and 1.5 mm. in diameter. The calyx walls are packed with comparatively large, bar-like or lenticular spicules which are criss-cross but show a tendency to be vertical when the polyp is expanded and horizontal, especially near the margin, when the polyp is retracted. The tentacles are closely folded over the oral disk and their dorsal surfaces are heavily armed with longitudinally disposed bar-like spicules like those in the calyx walls. These completely cover the dorsal surface with an imbricating series, the distal ends of some overlapping the basal ends of others, and are adherent to each-other so that the whole pseudo-operculum is made up of eight segments, each covering one tentacle with an adherent mass of overlapping bar-like spicules.

Spicules. These are all of the bar-like form, the bars often being somewhat expanded distally. Their ends are evenly rounded and their surfaces are quite smooth showing merely a very fine, dense, granulated appearance under moderately high powers of the microscope. Their profiles are smooth, not showing verrucæ or points of any size. They resemble in form certain spicules found in the Isidæ, e. g. *Bathygorgia profunda,* but are smoother than any others that the writer has seen.

Color. The colony is very light brown and the axis is the same.

This remarkable form shows a close resemblance to certain Isidæ, and would be placed in that family were the axis jointed. It also shows an approach to the Primnoidæ in the character of the operculum.

DISTRIBUTION OF THE GORGONELLIDÆ COLLECTED BY THE SIBOGA EXPEDITION.

List of Stations

at which Gorgonellidæ were secured, together with the depth and character of the bottom; and the species collected at each Station.

STATION 47. Bay of Bima, near South Fort. 55 meters. Mud, with patches of fine coral sand. *Verrucella flaviflora.*

STATION 50. Bay of Badjo, West coast of Flores. Up to 40 meters. Mud, sand and shells, according to locality. *Gorgonella rigida, Juncella juncea.*

STATION 53. Bay of Nangamessi, Sambu. Up to 36 meters. Coral sand, mud near shore. *Scirpearella gracilis.*

STATION 60. Haingsisi, Samau Island near Timor. 23 meters. *Juncella juncea, Scirpearella rubra, Scirpearella hemispherica.*

STATION 66. Bank between Islands of Bahuluwang and Tambolungan, south of Saleyer. Dead Coral, Halimeda, Lithothamnion. 8 to 10 meters. *Juncella juncea.*

STATION 80. 2°25′ S., 117°43′ E. Borneo bank. From 40 to 50 meters. Fine coral sand. *Scirpearella rubra.*

STATION 91. Muaras Reef, inner side; East coast of Borneo. Up to 54 meters. Hard coral sand. *Scirpearella rubra.*

STATION 96. Southeast side of Pearl Bank, Sulu Archipelago. 15 meters. Lithothamnion bottom. *Plumigorgia hydroides.*

STATION 99. 6°7′.5 N., 120°26′ E. North Ubian, Sulu Archipelago. 16—23 meters. Lithothamnion. *Juncella racemosa.*

STATION 117. 1°0′.5 N., 122°56′ S. Kwandang Bay entrance, Celebes. 80 meters. Sand and coral. *Nicella coralloides, Nicella carinata, Ellisella flava.*

STATION 123. North Bay, Biaru Island. 36—27 meters. Stone and Lithothamnion bottom. *Plumigorgia hydroides.*

STATION 133. Anchorage off Lirung, Salibabu Island. Up to 36 meters. Mud and hard sand. *Scirpearella rubra.*

STATION 154. 0°7′.2 N., 130°25′.5 E. 83 meters. Grey muddy sand, shells and Lithothamnion. *Nicella carinata.*

STATION 162. Between Loslos and Broken Islands, West Coast of Salawatti. 18 meters. Coarse and fine sand, with clay and shells. *Juncella juncea.*

STATION 164. 1°42′.5 S., 130°47′.5 E. near New Guinea. 32 meters. Sand and stone mixed with mud. *Juncella racemosa, J. juncea, Scirpearella rubra.*

STATION 166. 2° 28'.5 S., 131° 3'.3 E. near Misool. 118 meters. Hard coarse sand. *Scirpearella gracilis.*

STATION 172. Gisser, anchorage between this Island and Ceram-Laut. 18 meters. Coral and Lithothamnion bottom. *Scirpearella regia.*

STATION 204. 4° 20' S., 122° 58' E. Buton Strait. 75—94 meters. Sand with dead shells. *Gorgonella umbraculum, G. rigida, Scirpearella rubra, S. gracilis.*

STATION 208. 5° 39' S., 122° 12' E. Banda Sea. 1886 meters. Solid green mud. *Scirpearella gracilis.*

STATION 213. Saleyer Anchorage and surroundings, including Pulu Pasi Tanette, near the North point of Saleyer Island. Up to 36 meters. *Nicella carinata.*

STATION 240. Banda Anchorage. 9—45 meters. Black sand. Coral. *Juncella juncea, Scirpearella rubra.*

STATION 250. Anchorage off Kilsuin, West coast of Kur Island. 20—45 meters. *Juncella juncea.*

STATION 257. In Duroa Strait, Kei Islands. Up to 52 meters. Lithothamnion, sand and coral. *Gorgonella delicatula, Nicella coralloides, N. carinata.*

STATION 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral. *Juncella juncea, J. racemosa, J. sanguinea, Scirpearella rubra.*

STATION 260. 5° 36'.5 S., 132° 55'.2 E. Near Kei Islands. 90 meters. Sand, coral and shells. *Gorgonella rigida, Juncella racemosa, Scirpearella rubra, S. gracilis, Nicella carinata.*

STATION 267. 5° 54' S., 132° 56'.7 E. Gray mud with brown upper layer. 984 meters. *Isidoides armata.*

STATION 273. Anchorage off Pulu Jedan, East coast of Aru Islands, (Pearl Banks). 13 meters. Sand and shells. *Ctenocella pectinata, Juncella juncea, J. gemmacea.*

STATION 274. 5° 28'.2 S., 134° 53'.9 E. near Aru Islands. 57 meters. Sand and shells, stones. *Gorgonella orientalis, Scirpearella gracilis.*

STATION 282. 8° 25'.2 S., 127° 18'.4 E. Anchorage between Nusa Besi and the N. E. point of Timor. 27—54 meters. Sand, coral and Lithothamnion. *Juncella juncea.*

STATION 289. 9° 0'.3 S., 126° 24'.5 E. South coast of Timor. 112 meters. Mud, sand and shells. *Scirpearella gracilis.*

STATION 299. 10° 52'.4 S., 123° 1'.1 E. Buka or Cyrus Bay, South coast of Rotti Island. 34 meters. Mud, coral and Lithothamnion. *Ctenocella pectinata, Juncella gemmacea, J. sanguinea, Scirpearella gracilis.*

STATION 305. Mid Channel in Solor Strait, off Kampong Menanga. 113 meters. Stony. *Gorgonella orientalis, G. rigida, Scirpearella rubra, Nicella coralloides, Nicella carinata.*

STATION 306. 8° 27' S., 122° 54'.5 E. near Flores. 247 meters. Sandy mud. *Gorgonella orientalis.*

STATION 310. 8° 30' S., 119° 7'.5 E. Flores Sea. 73 meters. Sand, dead coral. *Gorgonella orientalis, Verrucella rubra, V. stellata, Juncella juncea, J. racemosa, Scirpearella rubra.*

STATION 315. Anchorage East end of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion. *Juncella juncea.*

It appears from this list that Gorgonellidæ were secured at 35 stations out of about 147 stations where the bottom was sucessfully explored with the dredge or trawl.

Station 310 seems to have yielded the greatest number of Gorgonellidæ, six species having been secured, the next best yield being Station 260 and Station 305 where five species were secured, while stations 204, 258 and 299 yielded four species each.

The most abundant species of Gorgonellidæ in the collection is *Juncella juncea*, which was secured at 12 stations, the next in abundance being *Scirpearella rubra* which was dredged from 11 stations; *Scirpearella gracilis* coming 3rd, being found at 8 stations. But one species of Gorgonellidæ was secured from each of 21 stations in the foregoing list.

Table showing the geographic and bathymetric distribution of the Gorgonellidae collected by the Siboga Expedition.

	BATHYMETRIC.				GEOGRAPHIC, ASIDE FROM DUTCH EAST INDIES.
	1 to 50 meters	50 to 100 meters	100 to 200 meters	Over 200 meters	
Gorgonella orientalis	.	*	*	*	Off Japan.
Gorgonella umbraculum	.	*	.	.	East Indies in general (Studer).
Gorgonella delicatula	.	*	.	.	
Gorgonella rigida	*	*	*	.	
Verrucella rubra	.	*	.	.	Gulf of Manaar.
Verrucella flaviflora	.	*	.	.	Red Sea.
Verrucella stellata	.	*	.	.	
Ctenocella pectinata	*	.	.	.	Indian Ocean, New Guinea, China Sea, Australian waters.
Juncella juncea	*	*	.	.	Indian Ocean.
Juncella gemmacea	*	.	.	.	Red Sea.
Juncella racemosa	*	*	.	.	Japan.
Juncella sanguinea	*	.	.	.	
Scirpearella rubra	*	*	*	.	Off Hyalonema Ground, Japan.
Scirpearella gracilis	*	*	*	*	Off New Hebrides.
Scirpearella regia	*	.	.	.	
Scirpearella hemispherica . . .	*	.	.	.	
Nicella coralloides	.	*	*	.	
Nicella carinata	*	*	*	.	
Ellisella flava	.	*	.	.	
Plumigorgia hydroides	*	.	.	.	
Isidoides armata	.	.	.	*	
Totals	12	14	6	3	

This table shows clearly that the Gorgonellidæ are essentially shallow water forms, all but one of the twenty one species in the Siboga collection having been secured from waters less than 100 meters in depth. While six species in the above list are known to be from more than 100 meters, but three of these *Scirpearella gracilis*, *Gorgonella orientalis* and *Isidoides armata*, were taken from over 200 meters by the Siboga Expedition. The records show that about 80 hauls of the dredge or tawl were taken in over 200 meters, and these should have yielded more than three species of Gorgonellidæ, if that family is at all common at such depths.

The deepest water from which a gorgonellid was taken was at Station 208 where *Scirpearella gracilis* was dredged. This species also has a very remarkable bathymetric range, being found from 34 to 1886 meters. *Isidoides armata* was taken from a depth of 984 meters.

The geographical distribution indicated by the table is, as would be expected from the bathymetric table, much more restricted than would have been the case with more characteristic deep water forms. All of the species represented by the Siboga collection are restricted to the Indo-Pacific region. A few species of the family Gorgonellidæ are, however, found outside of this region, at least five species *Verrucella gnadalupensis*, *V. ramosa*, *V. granulifera*, *Juncella extans* and *J. hystrix* having been reported from the Atlantic.

It remains true, however, that the apparent centre of distribution for this family is in the Oriental region and that its occurence elsewhere is exeptional.

Literature cited

in the Report on the Gorgonellidæ of the Siboga collection.

Délage et Hérouard. Traité de Zoologie concrète; Tome II, 2me Partie, les Coelentérés, Paris, 1901.

Duchassaing et Michelotti. Mémoire sur les Coralliaires des Antilles; Memorie della Reale Accademia delle Scienze di Torino, Serie 2, Vol. XIX, 1860.

Ellis and Solander. The Natural History of many curious and uncommon Zoophytes collected from various parts of the Globe by the late John Ellis, systematically arranged and described by the late Daniel Solander; London, 1786.

Esper, E. J. Die Pflanzenthiere in Abbildung nach der Natur, mit Farben erleuchtet nebst Beschreibung; Nürnberg, 1791.

Gray, J. E. Synopsis of the Families and Genera of the Axiferous Zoophytes or Barked Corals; Proceedings of the Zoological Society of London, Part 25, London, 1857.

—— Catalogue of Lithophytes or Stony Corals in the collections of the British Museum, London, 1870.

Hickson, Sydney J. The Alcyonaria of the Maldives, Part III, the Families Muriceidæ, Gorgonellidæ, Melitodiæ and the Genera Pennatula, Eunephthys; Fauna and Geography of the Maldive and Laccadive Archipelagoes, Vol. II, part IV, 1905.

Kölliker, A. Icones Histiologicæ oder Atlas der vergleichenden Gewebelehre; 2te Abtheilung, der feinere Bau der höheren Thiere; 1stes Heft, die Bindsubstanz der Cœlenteraten; Leipzig, 1865.

—— Anatomisch-systematische Beschreibung der Alcyonarien, 1ste Abth., die Pennetuliden; Frankfurt, 1872.

Klunzinger, C. B. Die Corallenthiere des Rothen Meeres, I. die Alcyonarien und Malacodermen, 1877.

Lamouroux, J. F. V. Exposition Méthodique des Genres de l'ordre des Polypiers, Paris, 1821.

—— Histoire des Polypiers coralligènes flexibles, vulgairement nommés Zoophytes; Caen, 1816.

Lamarck, M. de. Histoire naturelle des Animaux sans vertèbres, Tome 2; Paris, 1836.

Milne Edwards et Haime. Histoire naturelle des Coralliaires, ou Polypes proprement dits, Tome premier, I; Paris, 1857.

Nutting, C. C. Descriptions of the Alcyonaria collected by the Bureau of Fisheries Steamer Albatross in the Vicinity of the Hawaiian Islands in 1902. Proceedings of the U. S. National Museum, Vol. XXXIV, 1908.

Pallas, P. S. Elenchus Zoophytorum, Hagae, 1766.

—— Characteristik der Thierpflanzen; Nürnbérg, 1787.

Ridley, S. O. The Coral-fauna of Ceylon, with descriptions of new Species. Annals and Magazine of Natural History, Series 5, Vol. XI, London, 1883.

—— Report on the Zoological Collections made by H. M. S. Alert, London, 1884.

Studer, Th. Übersicht der Anthozoa Alcyonaria, welche während der Reise S. M. S. "Gazelle" um die Erde gesammelt wurden; Monatsbericht der Königlich Preussischen Akademie der Wissenschaften zu Berlin; Berlin, 1879.

—— Versuch eines Systemes der Alcyonaria; Archiv für Naturgeschichte; 53ster Jahrgang, Bd. 1, Heft I, 1887.

STUDER, TH. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck; Separatabdruck aus den Mitteilungen der Geographischen Gesellschaft und des Naturhistorischen Museums in Lübeck, II Ser., Heft 7 und 8; Lübeck, 1894.

—— Alcyonaires provenant des Campagnes du Yacht l'Hirondelle (1886—1888). Résultats des Campagnes scientifiques accomplies sur son Yacht par Albert 1er, Prince Souverain de Monaco, Fascicule XX; Monaco, 1901.

THOMSON and CRANE. Report on a Collection of Alcyonariens from Okhamandal and Kittiawar; London, 1909.

THOMSON and HENDERSON. Report to the Government of Ceylon on the Pearl Oyster Fisheries in the Gulf of Manaar. By W. A. HERDMAN, Supplementary Reports, N⁰. XX, the Alcyonaria; London, 1905.

THOMSON and SIMPSON. Report on the Alcyonaria collected in the Indian Ocean by the Royal Indian Marine Survey Ship "Investigator"; Part II, the Alcyonarians of the Littoral Area; Calcutta, 1909.

VALENCIENNES, M. Extrait d'une monographie de la famille des Gorgonidies de la Classe des Polypes; Comptes rendus hebdomadaires des Séances de l'Academie des Sciences, XLI, Paris, 1855.

VERRILL, A. E. List of the Polyps and Corals sent by the Museum of Zoology to other Institutions in Exchange, with Annotations; Bulletin of the Museum of Comparative Zoology, Vol. I, N⁰. 3, Cambridge, 1864.

WRIGHT and STUDER. Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873—76. The Voyage of H. M. S. Challenger, Zoology, Vol. XXXI, London, 1889.

EXPLANATION OF PLATES

The photographs were made from nature by the author.
The spicules were drawn under the camera lucida by Mr. DAYTON STONER.

PLATE I.

Fig. 1. *Verrucella flaviflora* (new name), Natural size. 1 *a*, part of branch × 5.
Fig. 2. *Gorgonella delicatula* n. sp. Natural size 2 *a*, part of branch × 5.
Fig. 3. *Gorgonella rigida* n. sp. Natural size. 3 *a*, part of branch × 5.

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CALIFOR

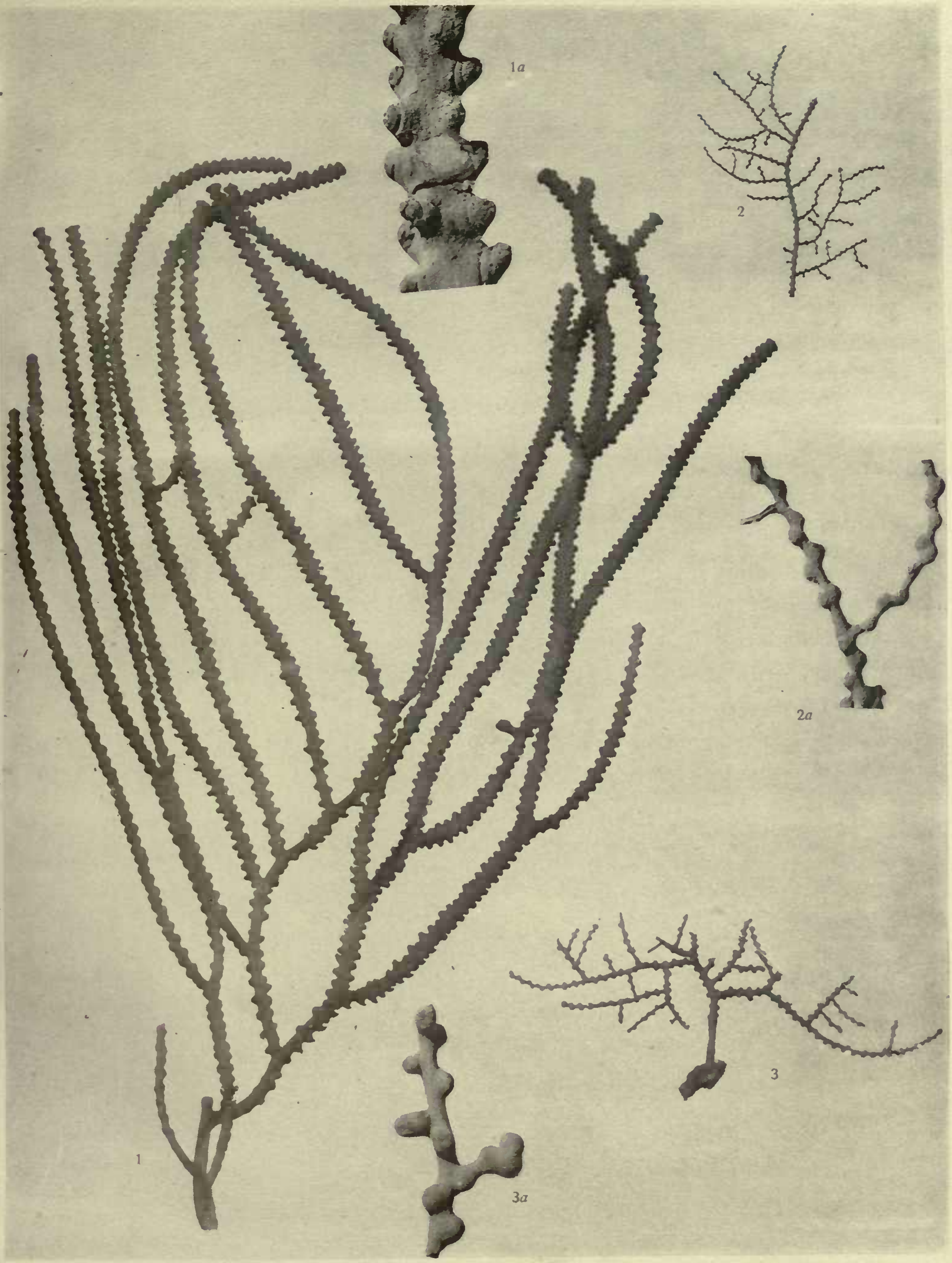

PLATE II.

Fig. 1. *Verrucella stellata* n. sp. Natural size. 1 *a*, part of tip of branch × 5.

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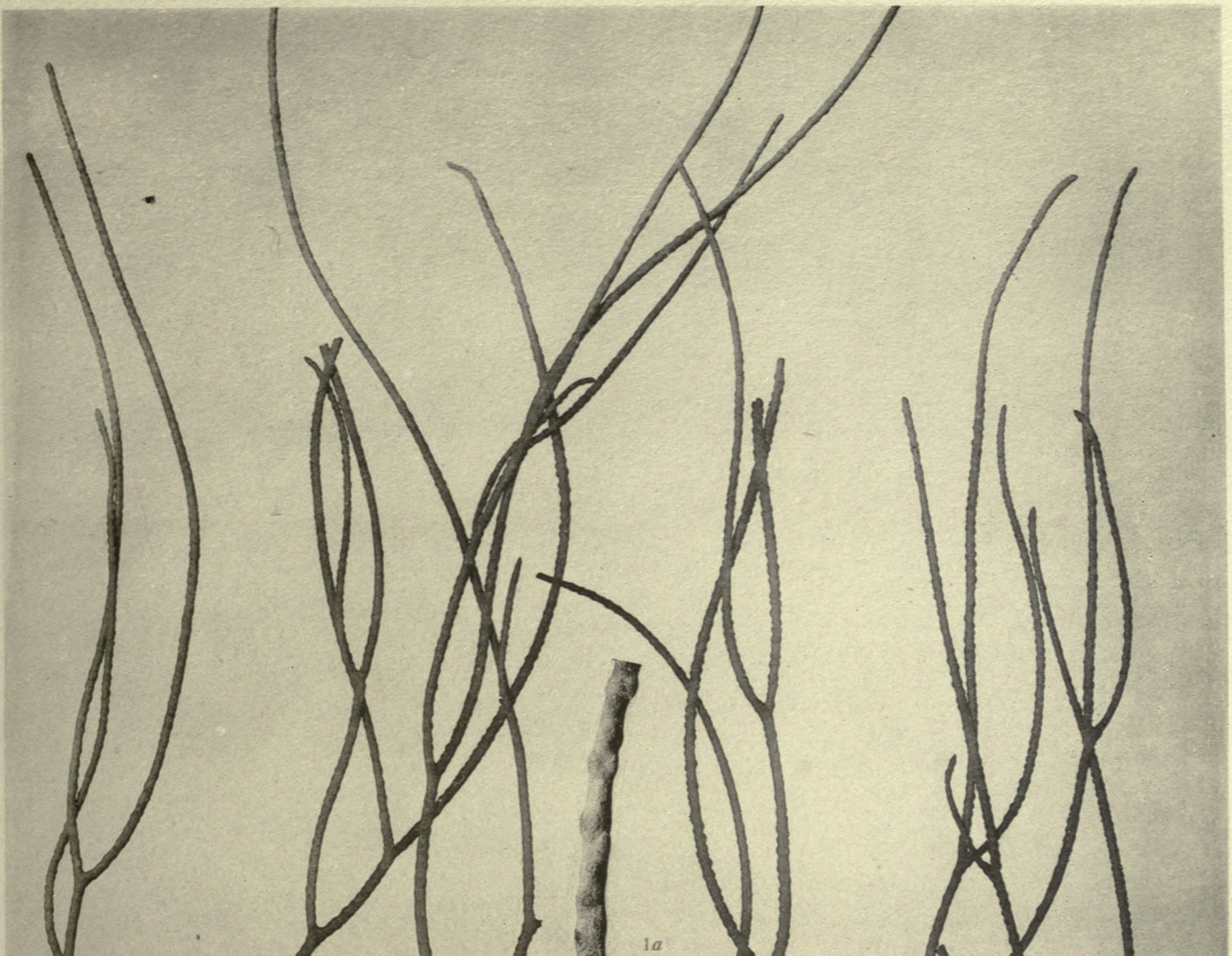

PLATE III.

Fig. 1. *Juncella juncea* (Pallas). Part of large red specimen, natural size.

Fig. 2. *Juncella juncea.* Part of another colony, red, with calyces more prominent. Natural size. *2a*, part of same specimen × 5.

Fig. 3. *Juncella juncea.* Part of a white colony, showing median impressed line. Natural size.

Fig. 4. *Juncella juncea.* Part of another white colony, much smaller. Natural size.

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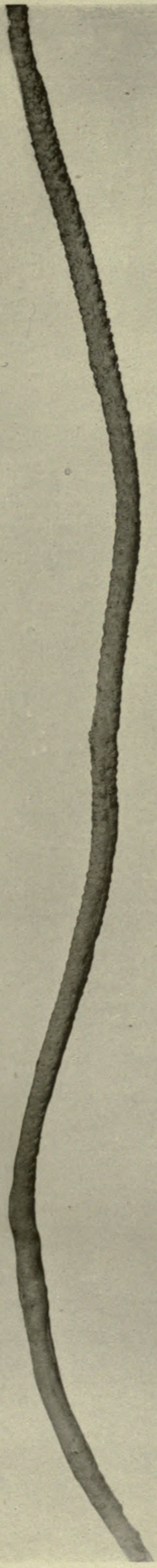

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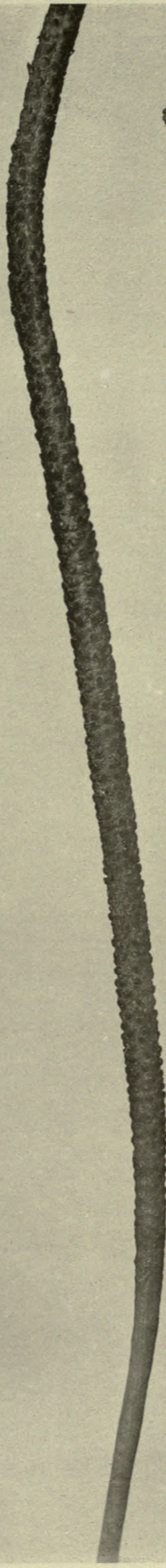

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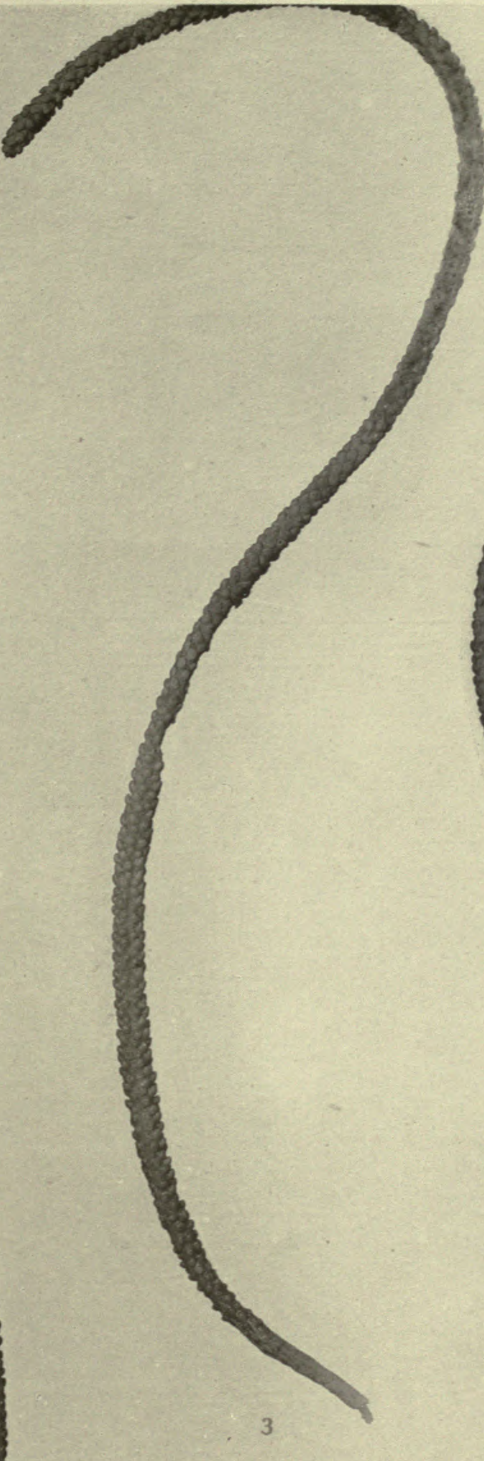

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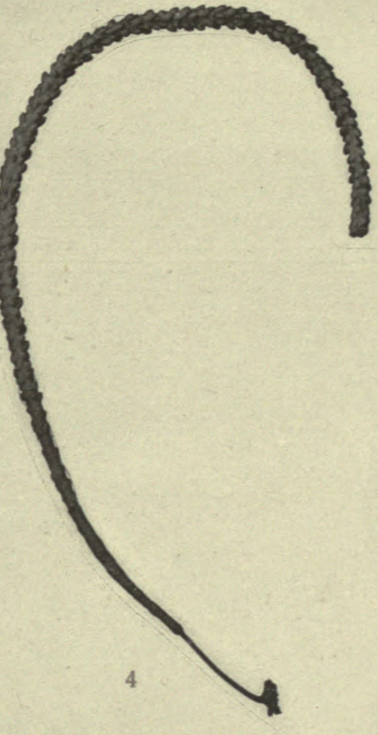

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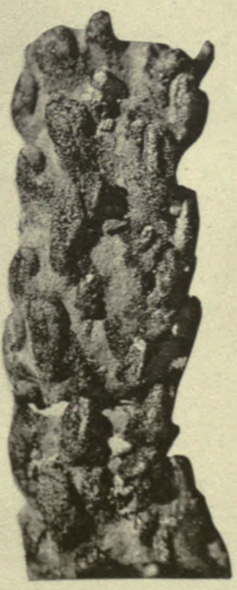

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PLATE IV.

Fig. 1. *Juncella gemmacea* (Val.). Natural size. 1 *a*, part of branch × 5.

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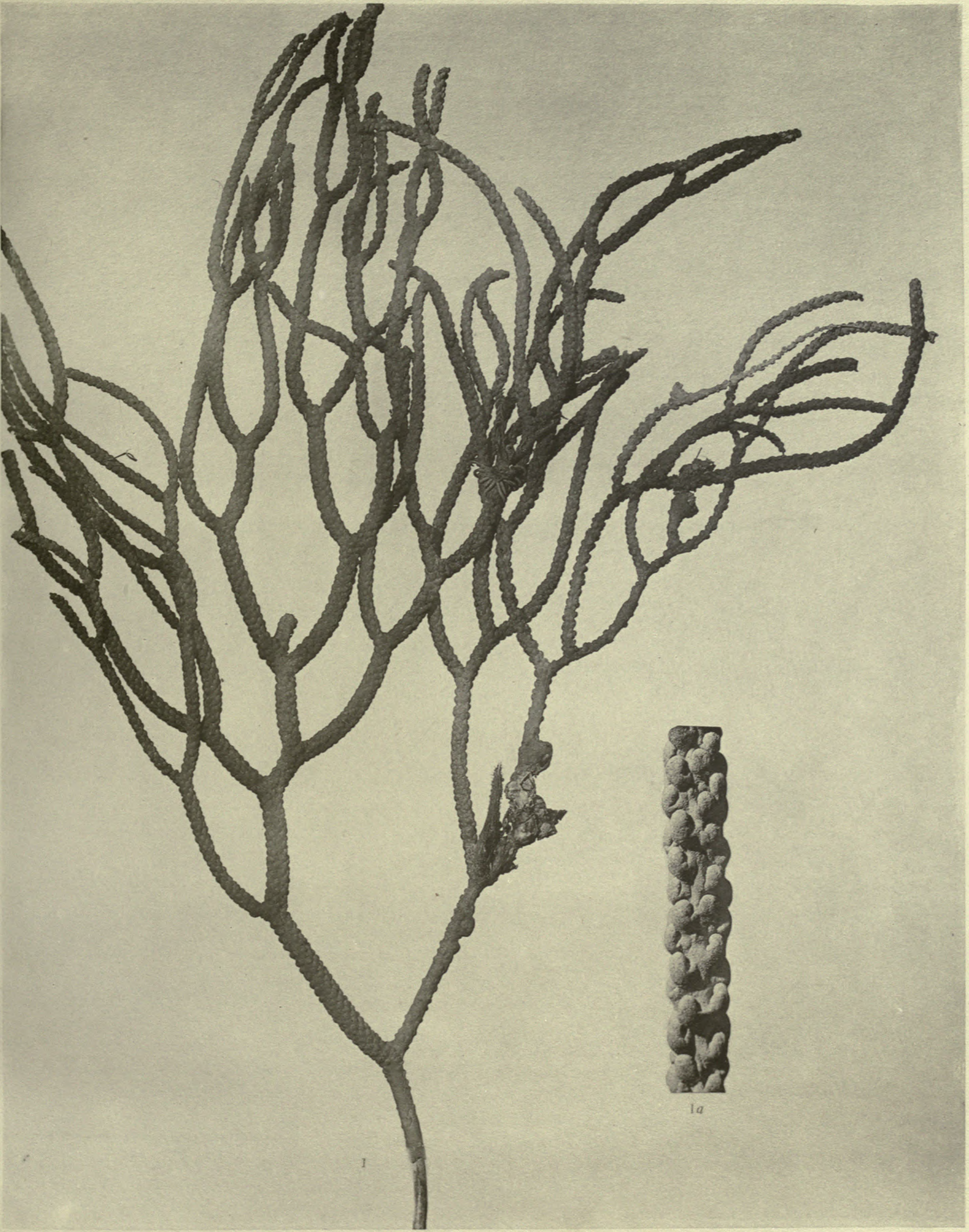

1a

1

PLATE V.

Fig. 1. *Juncella sanguinea* n. sp. Natural size. 1 *a*, part of branch × 5.

Fig. 2. *Scirpearella hemispherica* n. sp. Natural size. 2 *a*, part of branch × 5.

UNIV. CALIFOR

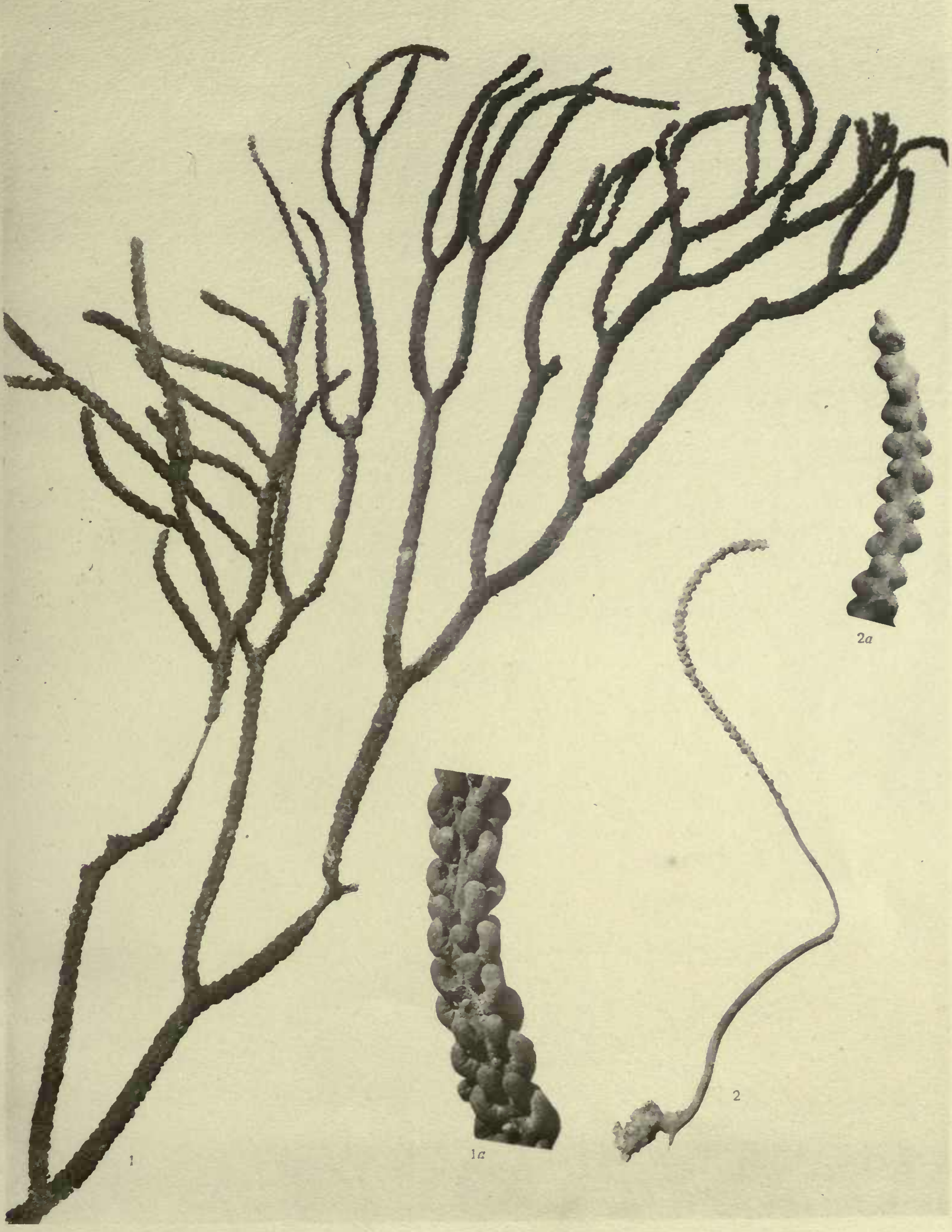

PLATE VI.

Fig. 1. *Scirpearella rubra* W. and S. Large red colony. Natural size. 1 *a*, part of colony × 5.
Fig. 2. *Scirpearella rubra.* Smaller red specimen. Natural size.
Fig. 3. *Scirpearella rubra.* More slender, white form. Natural size.
Fig. 4. *Scirpearella rubra.* Small red specimen. Natural size.
Fig. 5. *Scirpearella rubra.* Young colony, white, with opposite calyces. Natural size.

UNIV. OF CALIFORNIA

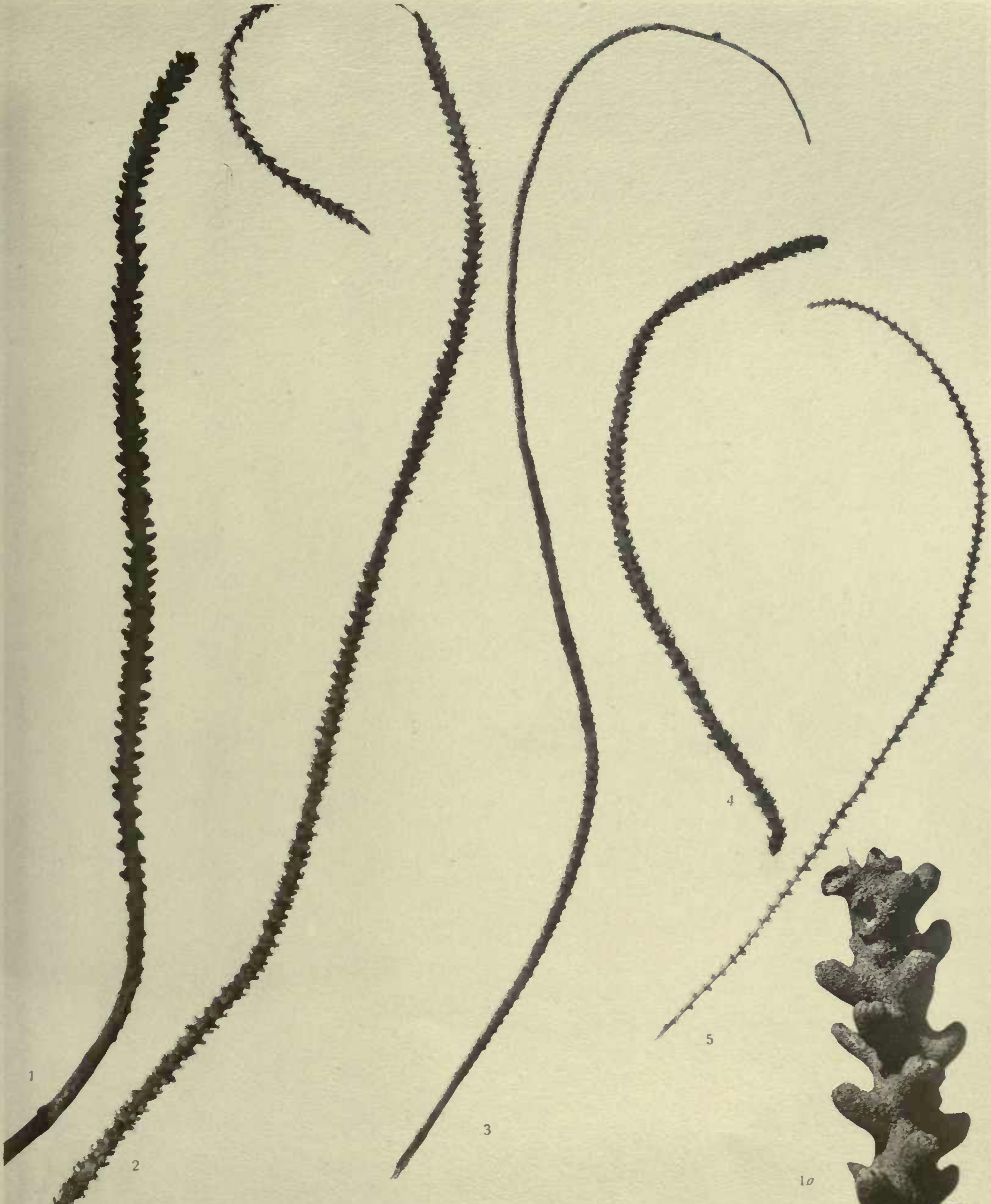

PLATE VII.

Fig. 1. *Scirpearella gracilis* W. and S. Fairly large colony, with calyces on all sides. Natural size. 1 *a*, part of colony × 5.

Figs. 2, 3 and 4. Smaller colonies of the same species, with alternate calyces. Natural size. 3 *a*, part of colony × 5.

Fig. 5. A very young colony, same species, with very regular lateral and alternate calyces.

UNIV. OF CALIFORNIA

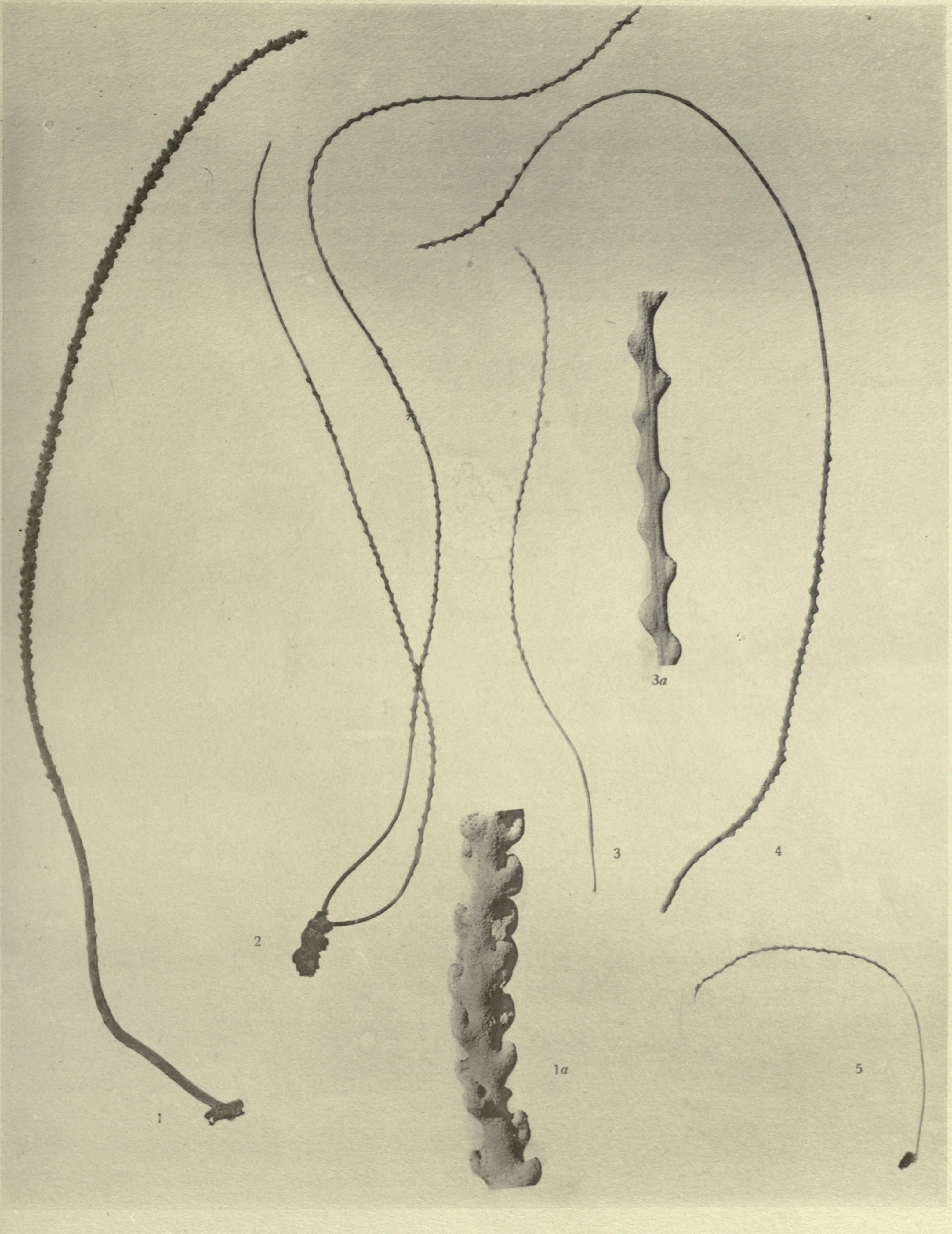

PLATE VIII.

Fig. 1. *Scirpearella regia* n. sp., with meter rod at right to show actual size. 1*a*, part of branch × 5.
Fig. 2. *Isidoides armata* n. sp. Natural size. 2*a*, part of branch × 5.

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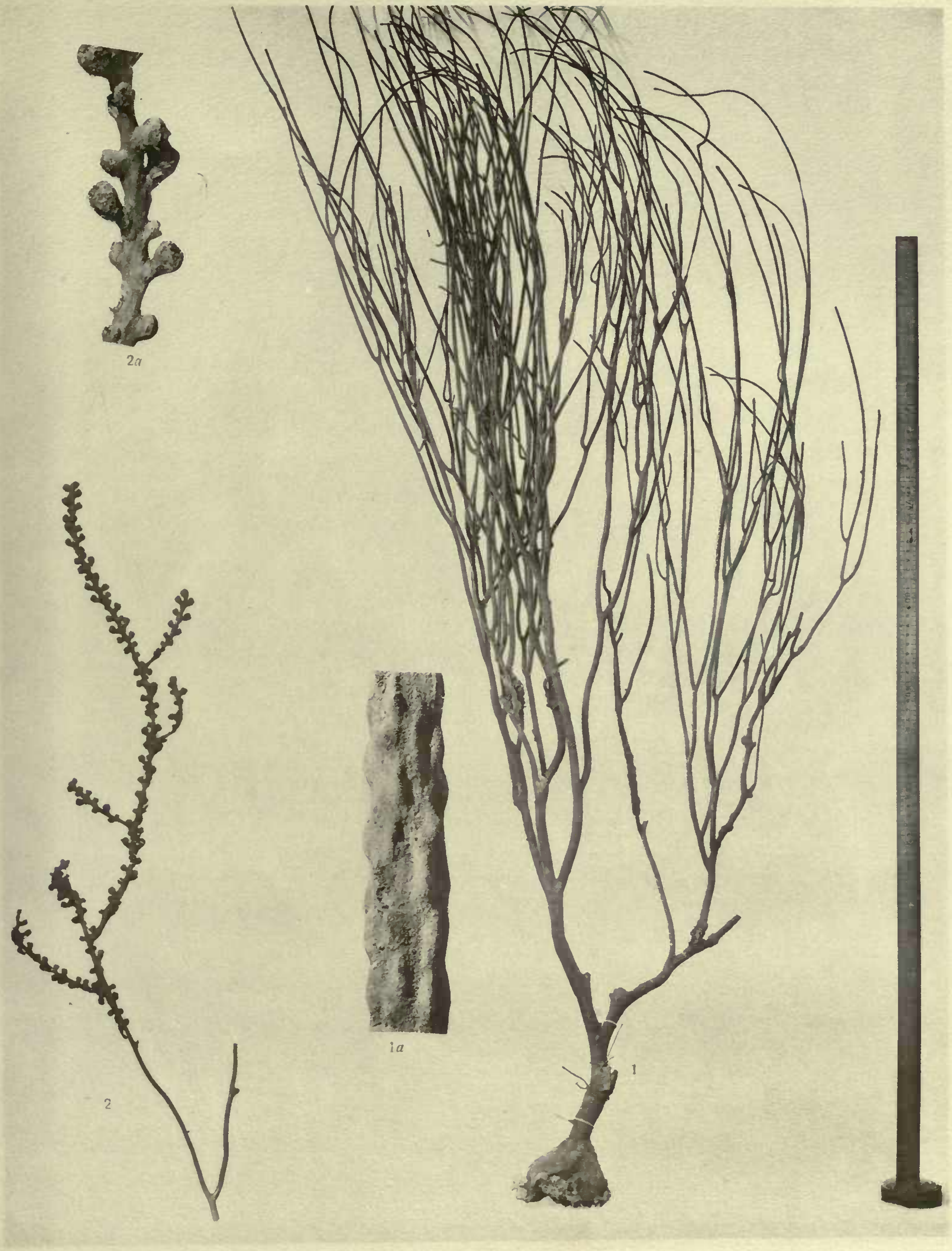
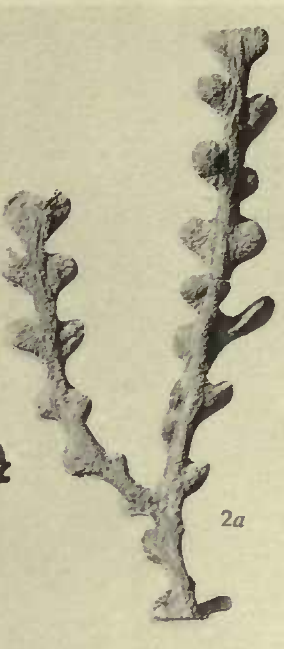


PLATE IX.

Fig. 1. *Nicella carinata* n. sp. Natural size. 1 *a*, part of branch × 5.
Fig. 2. *Nicella coralloides* n. sp. Natural size. 2 *a*, part of branch × 5.
Fig. 3. *Plumigorgia hydroides* n. sp. Natural size. 3 *a*, part of colony × 5.
Fig. 4. *Ellisella flava* n. sp. Natural size. 4 *a*, part of branch × 5.

UNIV. OF CALIFORNIA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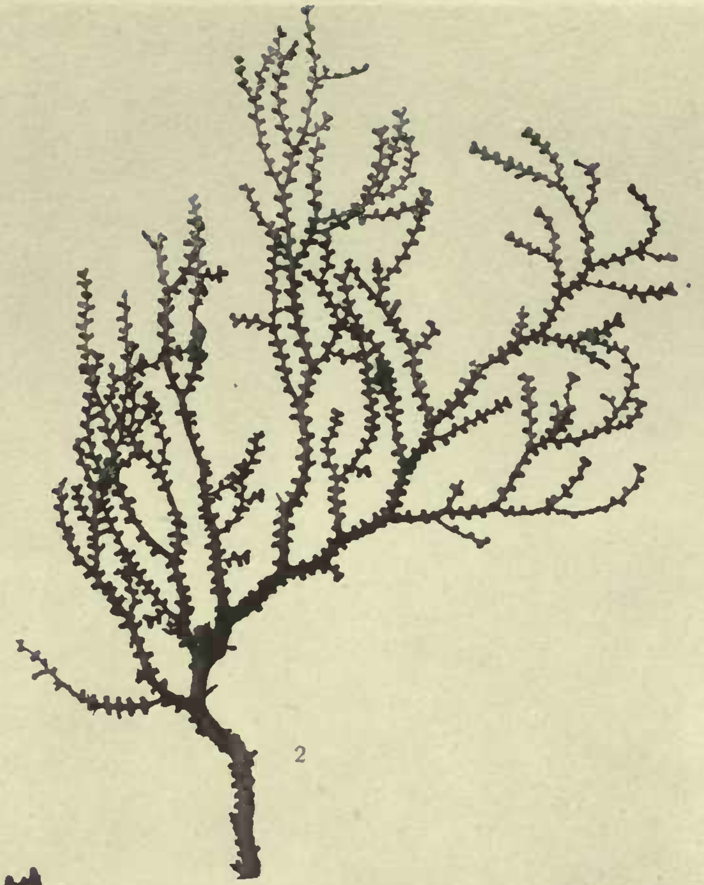
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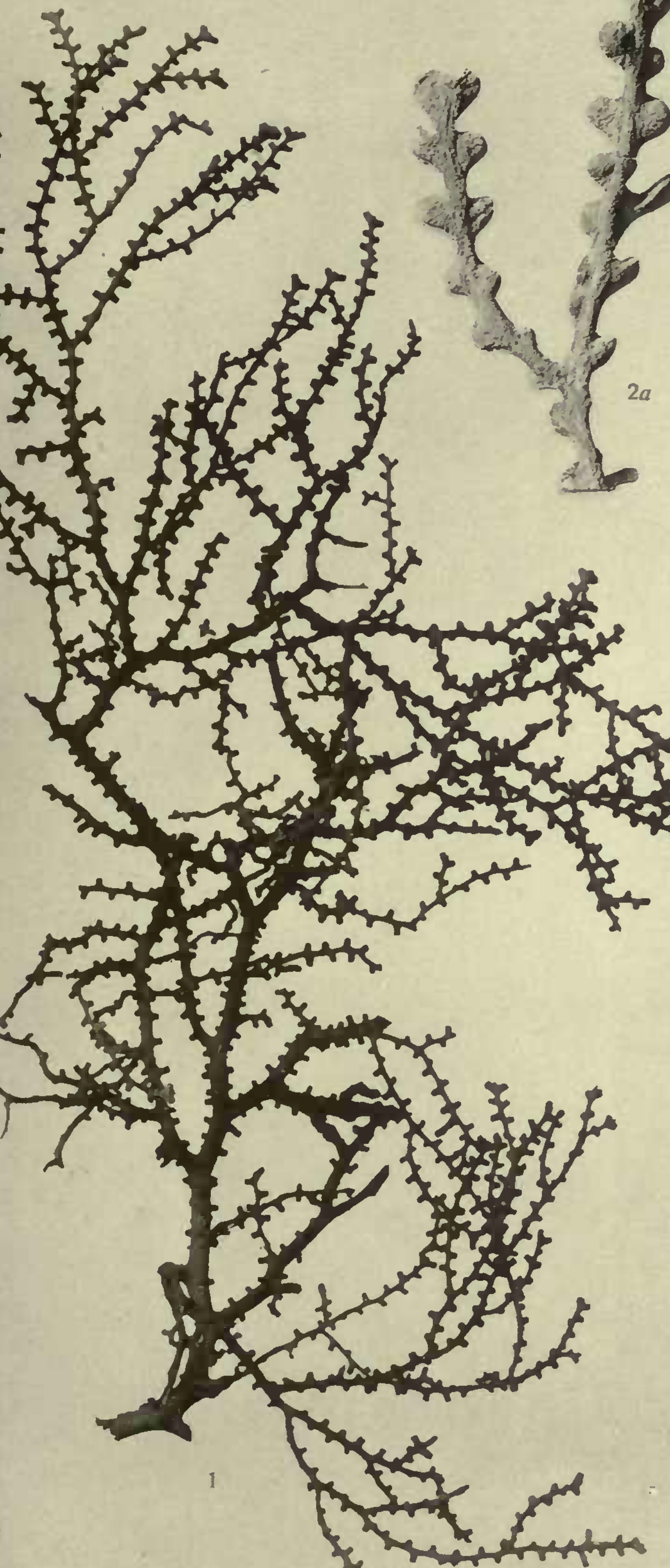
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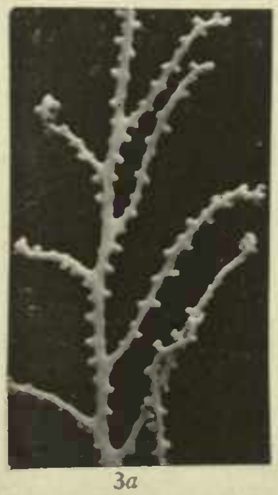
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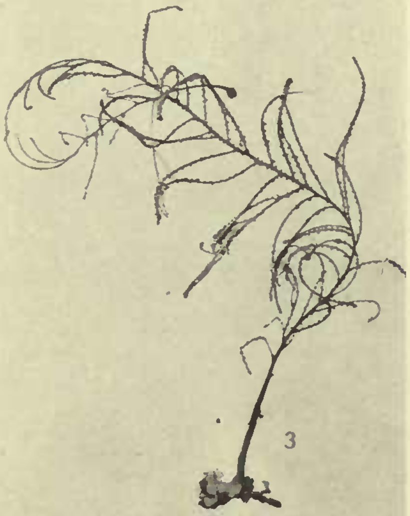
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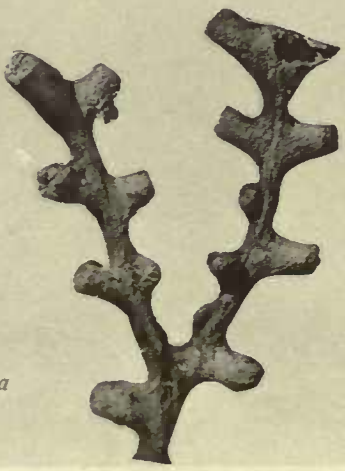
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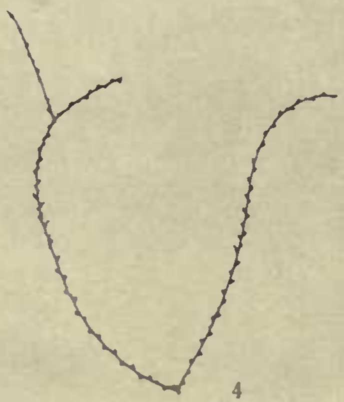
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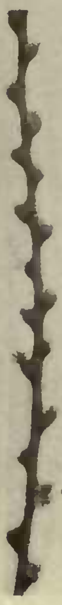
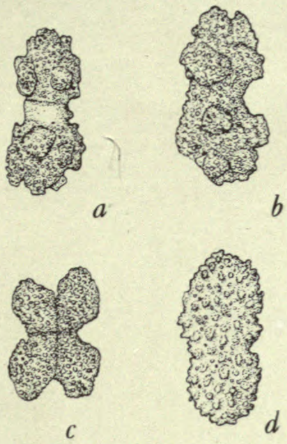

4a

PLATE X.

Fig. 1. *Gorgonella delicatula* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 2. *Gorgonella rigida* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 3. *Verrucella stellata* n. sp. Group of five spicules, *a*, *b*, *c*, *d* and *e*. × 330.
Fig. 4. *Juncella sanguinea* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 5. *Scirpearella regia* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 6. *Scirpearella hemispherica* n. sp. Group of three spicules, *a*, *b* and *c*. × 330.



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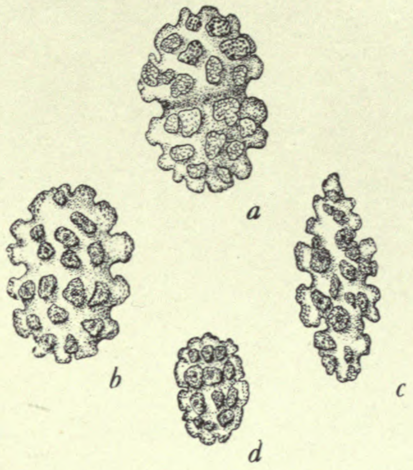

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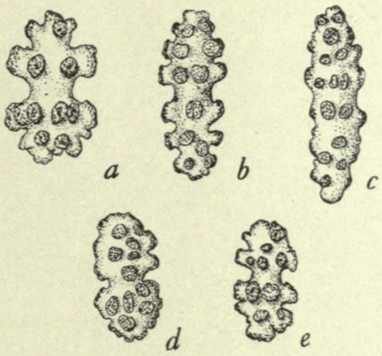

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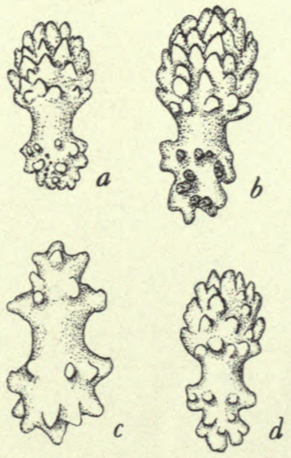

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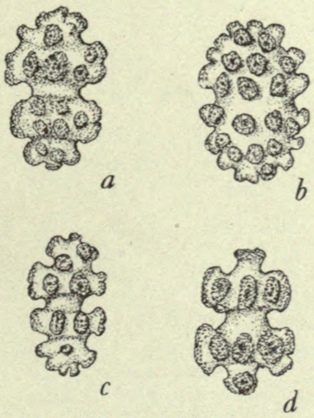

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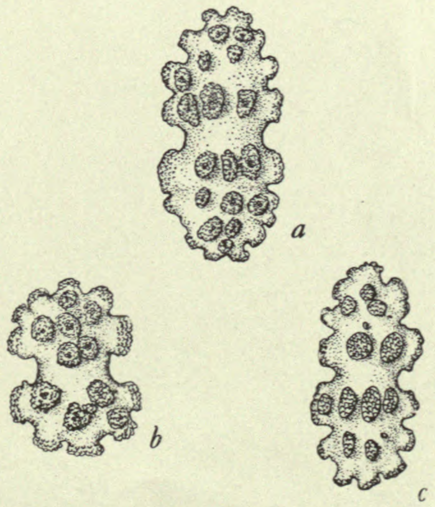

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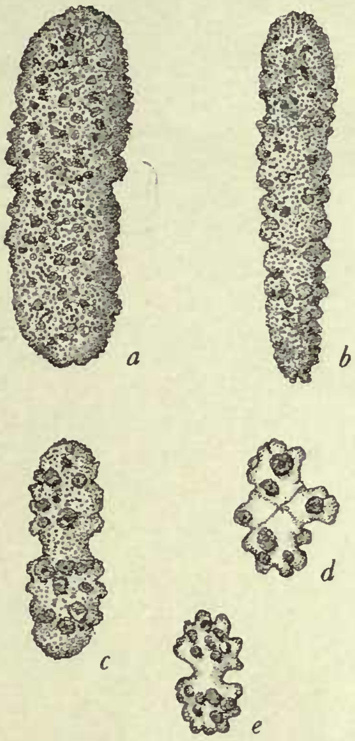
PLATE XI.

Fig. 1. *Nicella coralloides* n. sp. Group of five spicules, *a*, *b*, *c*, *d* and *e*. × 330.
Fig. 2. *Nicella carinata* n. sp. Group of three spicules, *a*, *b* and *c*. × 330.
Fig. 3. *Ellisella flava* n. sp. Group of three spicules, *a*, *b* and *c*. × 330.
Fig. 4. *Plumigorgia hydroides* n. sp. Group of four spicules, *a*, *b*, *c* and *d*. × 330.
Fig. 5. *Isidoides armata* n. sp. Group of five spicules, *a*, *b*, *c*, *d* and *e*. × 110.



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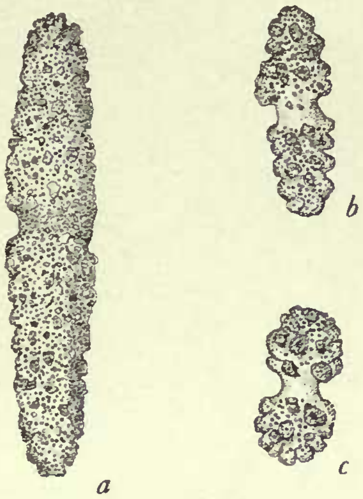

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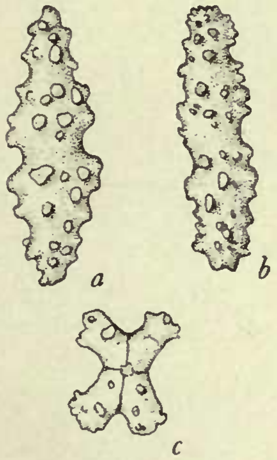

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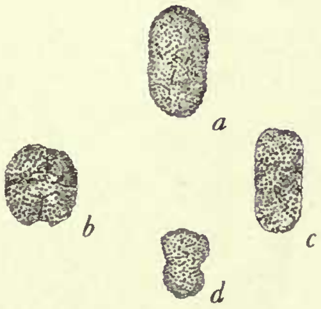

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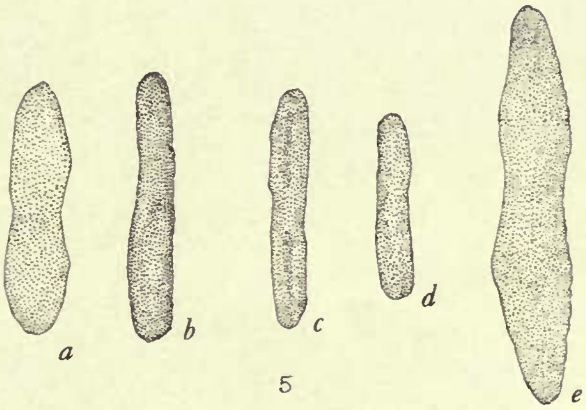

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THE GORGONACEA OF THE SIBOGA EXPEDITION

VII. THE GORGONIDÆ

Siboga-Expeditie
XIII b^4

THE
GORGONACEA OF THE SIBOGA EXPEDITION

VII. THE GORGONIDÆ

BY

C. C. NUTTING
Professor of Zoology, State University of Iowa

With 3 plates

(Aided by a grant from the ELIZABETH THOMPSON SCIENCE FUND)

LATE E. J. BRILL
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REESE

THE GORGONACEA OF THE SIBOGA EXPEDITION

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C. C. NUTTING,
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With 3 plates.

(Aided by a grant from the ELIZABETH THOMPSON SCIENCE FUND.)

Family GORGONIDÆ Verrill.

Gorgonacées (in part) Milne Edwards et Haime. Histoire naturelle des Coralliaires, I, 1857, p. 144.
Gorgonia Kölliker. Icones Histiologicæ, II, 1865, p. 135.
Gorgonidæ Verrill. Transactions Connecticut Academy of Arts and Sciences, I, 2, 1867—71, p. 384.
Gorgonaceæ (in part) Duchassaing de Fontbressin. Revue des Zoophytes et des Spongiaires des Antilles, 1870.
Gorgonidæ Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 61.
Gorgonidæ (in part) Ridley. Alcyonaria of the Mergui Archipelago, 1888, p. 233,
Gorgonidæ Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 146.
Gorgoninæ Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 420.
Gorgonidæ Hickson. Alcyonaria of the Cape of Good Hope, II, 1904, p. 227.
Gorgonidæ Nutting. Alcyonaria of the Californian Coast, 1909, p. 722.

Although VERRILL (1867—71) appears to have been the first one to use the name Gorgonidæ in its restricted sense as a family designation, he does not appear to have defined it, although he discusses several of its genera at considerable length.

KÖLLIKER (1865) uses the word Gorgonidæ as a family designation, but as thus used it embraced the whole of what is now known as the Gorgonacea. This writer employs the name "Gorgonacea" for a section of his subfamily "Gorgoninæ", thus practically reversing the relative rank of the names as we now know them. In his genus "Gorgonia" he includes practically all of the species then known that would now go into the family Gorgonidæ. The first formal and adequate definition of the family was given by STUDER in 1887 in his classic work "Versuch eines Systemes der Alcyonaria" which is probably the most helpful single contribution to our knowledge of the general systematic treatment of the Alcyonaria. His definition will be adopted for our present purpose, and may be translated as follows:

"Colony upright, branched, usually flabellate, with horny (rarely calcareous) axis. Polyps bilaterally or biradially placed on stem and branches, corresponding to a biradiate arrangement of the canal system. The upper part of the polyp is retractile either into an exserted calyx or within the cœnenchyma which presents a smooth surface. The spicules are small, preponderatingly spindles which are not arranged in two layers".

The region explored by the Siboga Expedition is one in which the family Gorgonidæ is very poorly represented, and the collection contains so few species (five in all) that it does not offer a basis for a systematic discussion. The writer will therefore content himself with adopting, in the main, the excellent generic definitions of STUDER, and will discuss only the four genera represented in the collection.

The paucity of representation of this family in this and other extensive collections in the East Indies is remarkable when contrasted with the great number of Gorgonidæ in the West Indies and on the Pacific Coast of tropical America, and indicates very plainly that the centre of distribution of the Gorgonidæ is in the warmer waters of the Western Hemisphere.

Synoptic view of the genera and species of GORGONIDÆ collected by the Siboga Expedition.

New species are indicated by an asterisk (*).

Lophogorgia.

Lophogorgia **pinnata*.

Leptogorgia.

Leptogorgia **formosa*.

Stenogorgia.

Stenogorgia miniata, *S.* **studeri*.

Platycaulus.

Platycaulus **sibogæ*.

The only previously known species in this list, *Stenogorgia miniata* (Valenciennes) has hitherto been known only from the Atlantic Ocean, where it has been taken in the West Indies and Azores.

Systematic description of genera and species.

Genus **Lophogorgia** Milne Edwards et Haime.

Lophogorgia Milne Edwards and Haime. Histoire naturelle des Coralliaires, I, 1857, p. 167.
Gorgonia (in part) Kölliker. Icones Histiologicæ, II, 2, 1865, p. 139.
Leptogorgia (in part) Verrill. Transactions Connecticut Academy of Arts and Sciences, I, 2, 1867—71, p. 387.
Leptogorgia Duchassaing de Fontbressin. Revue des Zoophytes et des Spongiaires des Antilles, 1870, p. 17.
Lophogorgia Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 63.
Lophogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 150.
Lophogorgia Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 420.

The original definition of this genus is as follows:

"Polypiéroide étalé en forme de panache ou d'éventail, à une ou à plusieurs branches maitresses et à tige aplatie".

Kölliker (1865) placed practically all of the genera of Gorgonidæ, including *Lophogorgia*, in the genus *Gorgonia*.

No further definition of the genus appears until Studer, (1887) gave the definition of which the following is a translation:

"Colony upright, flabellate, with flattened stem and branches and cylindrical twigs. Polyps without calyces, immersed in the cœnenchyma and scattered on all sides of the ultimate branchlets. The larger water-vascular canals are on the flattened sides of the branches, but are peripheral on the round twigs. Spicules small double spindles".

Wright and Studer, (1889) give a definition which is practically identical with the one just quoted, and which is adopted in the present work.

The type of the genus *Lophogorgia* is *Lophogorgia palma* (Pallas). Other described species are *Lophogorgia alba*[1], *L. crista* Möbius, *L. irregularis* Thomson and Henderson, *L. lütkeni* Wright and Studer, *L. rubrotincta* T. and H. and the single new species in the Siboga Collection[2].

1. *Lophogorgia pinnata* new species. (Plate I, figs. 1, 1*a*; Plate III, fig. 1).

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters.

Colony flabellate in form, branching pinnate, not anastomosing, height 31 cm., spread about 12 cm. The stem and larger branches are flattened and marked on their flat surfaces with impressed grooves which are often tortuous and irregular in number and extent. Stem with a cross section of 4.5 mm. × 3.6 mm. 4 cm. from its base it divides into two large and subequal branches. One of these is quite tortuous in its proximal part, giving off irregularly alternate and lateral branchlets which are usually simple, slender and curved outward. The distal part of this branch is comparatively straight and gives off usually simple irregularly alternate branches some of which bear branchlets of the third order. The other main branch is straighter than the first, gives off branchlets from one side only of its proximal part and is pinnately branched distally. One of the proximal branchlets bears a regularly spaced row of slender unilateral branchlets resembling those of *Ctenocella*. The ultimate branchlets are all long, slender, round and usually erect. They reach a length of 17 cm. and are about 1.5 mm. in diameter. The calyces are entirely included, being indicated by mere tumidities on the surfaces of the branches and by their openings. They are lacking on the main stem and proximal parts of the larger branches and are mostly lateral on the smaller branches, but sometimes on all sides of the twig terminations.

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[1] This species is merely mentioned by Duchassaing de Fontbressin (1870) who does not give the authority.

[2] *L. flammea* (Ellis and Solander) is regarded by Milne Edwards and Haime as a synonym of *L. palma* (Pallas).

The individual calyces are so entirely included that they do not admit of description or measurement. Their mouths are indicated by oval openings such as are found in many Plexaurids, and often approach the form of linear slits about 5 mm. in length. Their margins form a slightly elevated rim with scarcely any evidence of lobes. The polyps are deeply retracted within the cœnenchyma, where they take the form of flattened discs with an oval outline and with their tentacles armed with longitudinally disposed spindles.

A cross section of the stem shows a thin cœnenchyma and large water-vascular canals on all sides of the flattened horny axis.

Spicules. These are nearly all double spindles or girdled spindles, more slender than usual and often curved. They are surrounded by symmetrical whorls of verrucæ, the two whorls which bound the girdle being more conspicuous than the others, which diminish gradually in size towards the ends of the spindle. The spicules of this species are remarkably uniform in character, differing mainly in size, due probably to relative age.

Color. Colony white, axis black proximally, lightening distally.

Genus **Leptogorgia** Milne Edwards (emended by Verrill).

Leptogorgia (in part) Milne Edwards et Haime. Histoire naturelle des Coralliaires, I, 1857, p. 163.
Gorgonia (in part) Kölliker. Icones Histiologicæ, II, 1865, p. 139.
Leptogorgia Verrill. Transactions Connecticut Academy of Arts and Science, I, 2, 1867—71, p. 387.
Leptogorgia Verrill. American Journal of Arts and Science, XLVII, 1869, p. 419.
Leptogorgia Studer. Monatsbericht der Königl. Akad. der Wissenschaften zu Berlin, 1878, p. 654.
Leptogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 151.
Gorgonia (in part) Hickson. Alcyonaria and Hydrocorallinæ of the Cape of Good Hope, 1900, p. 81.
Leptogorgia Delage et Hérouard. Traité des Zoologie concrète, II, 2, 1901, p. 420.
Leptogorgia Nutting. Alcyonaria of the Californian Coast, 1909, p. 722.

The original definition of this genus is as follows:

"Les espèces à axe non calcifère, dont le cœnenchyme est pelliculaire c'est-à-dire très-mince, et d'un tissu serré et dont les calyces n'ont pas les bords saillants. Elle se distingue donc des Gorgones proprement dites, par l'absence de verrues calicifères et s'éloigne des Plexaures par la disposition du cœnenchyme, qui, chez ces derniers, est remarquablement épars et d'une texture subéreuse".

Verrill (1869—71) defines the genus as follows:

"Spicula of the cœnenchyma mostly small double-spindles of two forms, longer and shorter. Branches usually slender, subdividing in various ways; often reticulate, pinnate or bipinnate. Cells usually prominent, sometimes flat, mostly in lateral rows or bands".

Studer (1887) gives a definition which is acceptable for our purpose, and of which the following is a translation:

"Colony variously branched, more or less flabellate, often reticulate. Calyces small or included, usually disposed laterally with naked cœnenchyma between. On the bare surfaces the water-vascular canals are indicated by furrows. Spicules minute double spindles of longer and shorter forms.

The type of this genus is *Leptogorgia viminalis* (Esper). A large number of species have been assigned to this genus, especially by Verrill, and most of the species in the following list are given on his authority, the present writer having been unable to examine the types or to identify the species by the usually very brief descriptions.

Leptogorgia adamsii Verrill, *L. alba* Verrill, *L. agassizii* Verrill, *L. arbuscula* (Philippi), *L. arenata* (Val.), *L. aurantiaca* (Val.), *L. australiensis* Ridley, *L. boryana* (Val.), *L. californica* Verrill, *L. carolinensis* Verrill, *L. caryi* Verrill, *L. cauliculus* (Val.), *L. cuspidata* Verrill, *L. divergens* Studer, *L. diffusa* Verrill, *L. floræ* Verrill, *L. floridiana* Verrill, *L. flavida* Verrill, *L. flexilis* Verrill, *L. labiata* Verrill, *L. media* Verrill, *L. mineacea* (Esper), *L. mineata* Verrill, *L. nobilis* Verrill, *L. peruana* Verrill, *L. pinnata* (Lamk.), *L. porissima* Edwards and Haime, *L. pulchra* Verrill, *L. pumila* Verrill, *L. purpuracea* (Pallas), *L. purpurea* (Pallas), *L. ramulus* (Val.), *L. rigida* Verrill, *L. rosea* (Lamk.), *L. rutila* Verrill, *L. tenuis* Verrill, *L. setacea* Verrill, *L. sanguinolenta* (Pallas), *L. sarmentosa* (Esper), *L. sanguinea* (Val.), *L. stenobrachis* Verrill, *L. teres* Verrill, *L. torresia* Thomson and Herderson, *L. webbiana* (Val.), *L. virgea* (Val.), *L. virgulata* (Lamk.), and the species described beyond.

Many of the above named species have been so inadequately described that identification is practically impossible. In view of this fact the writer thinks it better to describe the single species in the Siboga Collection as new, although he is fully aware that it may be one of the species in the above list.

1. *Leptogorgia formosa* new species (Plate I, figs. 2, 2*a*; Plate III, fig. 2).

Stat. 33. Bay of Pidjot, Lombok. 22 meters and less.

Colony (dried) strictly flabellate, not reticulate although there are a very few anastomoses. Stem and branches round. The main stem extends almost straight to the distal end of the colony. Height 11.8 cm., spread 7.3 cm.; diameter of main stem 2.4 mm. About 1 cm. above its disk-shaped base of attachment the main stem gives off two very strong opposite branches. Above this it gives off irregularly lateral branches at short intervals throughout its length. These in turn give off numerous lateral branchlets most of which are simple, but some of which rebranch until branchings of the fourth order are attained. The whole forms a densely branched typically flabellate structure which appears at first sight to be reticulate, but is not really so.

The distance between branches varies from 2.5 mm. to 11.5 mm. but 3 mm. is a common distance. The calyces are mainly lateral in position, but may be on all sides of the branches. In the dried specimen they are hardly evident, appearing to be entirely included in the cœnenchyma. They were probably low warty verrucæ in the fresh specimen.

The individual calyces can not be successfully studied in the specimen described. In many cases their mouths are so completely closed that there is no trace of an opening, and their diameter can not be measured on account of their walls fading insensibly into the general cœnenchyma of the branch. In some cases the openings appear as oval pores. The characters of the polyps can not be ascertained from the type.

The axis is horny, but shows traces of impregnation by lime salts, particularly in the basal parts. There are no grooves on the stem or branches.

Spicules. These are small spindles, double spindles, girdled spindles and a few double heads. All are regularly tuberculated, the tubercles being usually in definite whorls.

Color. The dried specimen is a dark, bright pink, tending to a carmine. The spicules are mostly carmine.

Genus **Stenogorgia** Verrill.

Stenogorgia Verrill. Bulletin Museum Comparative Zoology, XI, 1, 1883, p. 29.
Stenogorgia Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 64.
Stenogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. LXII.
Stenogorgia Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 420.
Stenogorgia Nutting. Alcyonaria of the Californian Coast, 1909, p. 722.

The original description of the genus Stenogorgia is as follows:

"Axis horny, branched. Cœnenchyma thin, consisting chiefly of small, warty fusiform spicula, with a few smaller, short, irregular, rough, granule-like spicula next the outer surface, but not forming any regular layer. Calyces scattered or two rowed, more or less prominent, eight-rayed at summit, and filled with spicula like those of the cœnenchyma. Tentacles filled with fusiform spicula and usually incurved, commonly not retracted within the calyces, but capable of it".

STUDER (1887) and subsequent writers adopt this definition without material modification.

The type species of this genus is *Stenogorgia casta* Verrill. Other known species are *Stenogorgia ceylonensis* Thomson and Henderson, *S. kofoidi* Nutting, *S. miniata* (Valenciennes), *S. rosea* Grieg and the new species collected by the Siboga Expedition.

1. *Stenogorgia miniata* (Valenciennes).

Gorgonia miniata Valenciennes. Comptes rendus, XLI, 1855, p. 12.
Gorgonia miniata Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 160.
Gorgonia miniata Pourtalès. Contributions to the Fauna of the Gulf Stream at Great depths, 1868, p. 160.
Stenogorgia miniata Studer. Alcyonaires provenant des Campagnes de l'Hirondelle, 1901, p. 51.

Stat. 80. 2°25′ S., 117°43′ E. From 50 to 40 meters.
Stat. 117. 1° 0′.5 N., 122°56′ E. 80 meters.
Stat. 310. 8°30′ S., 119° 7′.5 E. 73 meters.

Colony (incomplete) flabellate and not reticulate in form, 4.6 cm. high and with a spread of 4.7 cm. The main stem is round in section and 1.5 mm. in diameter. The branches are all lateral, there being 7 on one side and 4 on the other. 5 of the branches are compound, giving off irregularly disposed lateral branchlets, branchings of the third order being sometimes attained. There is no regularity whatever in the distance between branches. The calyces are mainly lateral in position, but may be on all sides of the terminal twigs, and are very unevenly spaced, being from less than 1 mm. to 2 mm. apart.

The individual calyces are dome-shaped verrucæ with the summits divided into 8 not very strongly marked lobes. A typical one measures. 6 mm. in height and 1 mm. in diameter near the base. The upper part of the calyx wall is filled with spicules arranged en chevron and rising in 8 low points around the margin. The polyps are completely retractile and show a well-marked but slender collaret composed usually of a single row of transverse spindles. The tentacles have comparatively large spindles arranged en chevron on their proximal parts and longitudinally placed on the distal parts.

The general cœnenchyma is covered with rather large tuberculate spindles which are usually longitudinal but may lie in any direction. The axis is wholly corneous and the water-vascular canals are not conspicuous.

Spicules. These are nearly all regularly and densely tuberculated terete spindles, usually straight but sometimes curved. They never show a distinct girdle. Most of them are less than .5 mm. long, but an occasional one is found which is relatively large, reaching a length of 1 mm. Minute crosses and irregularly branched forms are occasionally seen.

Color. The colony is a rather dark scarlet, and the spicules are yellowish red or orange.

General distribution. The type was secured in the Antilles. It has also been reported by STUDER from the Azores, depth 454 meters.

The Siboga specimens agree well with the description and figures given by STUDER. This form reminds one of certain species of the muriceid genus *Muricella*, but the spicules are much smaller than is usual in that genus.

2. *Stenogorgia studeri* new species. (Plate II, figs 1, 1*a*; Plate III, fig. 193).

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 meters.

Colony flabellate and not reticulate, rigid in habit. The main stem and larger branches are distinctly flattened and grooved on their flat surfaces. Colony 11 cm. in height. The main stem is 2.5 mm. by 2 mm. in section. 4.4 mm. from its base the stem forks, but one of the resultant branches is broken off at its origin. The other main branch bears a number of laterally disposed branchlets which are irregularly spaced and themselves bear lateral branchlets which occasionally bear twigs of the fourth order of branching. The stem and main branches are distinctly furrowed on one of the flattened sides and indistinctly so on the other. Almost all of the calyces are lateral in position and tend to be alternate on the distal parts of the twigs.

The individual calyces are warty of dome-shaped verrucæ, a typical one measuring

8 mm. in height and 1.3 mm. in diameter at the base. They are closely approximated on the distal parts of the colony and more distant, although still rather closely emplanted on the proximal parts. The margin is surrounded by 8 lobes which form an 8-rayed figure when viewed from above. The calyx walls are filled with densely tuberculate spindles which are usually horizontal on basal parts and tend to be vertical on distal parts, especially in the marginal lobes. In the cœnenchyma the spicules are longitudinal as a rule. The polyps are completely retractile, and in retraction lie well below the infolded lobes of the calyx margin. The collaret is very weak, scarcely evident. The tentacles are covered on their dorsal surfaces by small tuberculate spindles which are longitudinal on the distal parts and tend to an en chevron arrangement on the proximal parts.

The cœnenchyma is moderately thin. A cross section of the stem shows inconspicuous water-vascular canals and a corneous axis which is slightly flattened.

Spicules. Stout, densely tuberculate spindles of moderate size, with the tubercles not arranged in distinct whorls, are the characteristic form of this species. Those in the tentacles are smaller and more slender. Rarely a clubshaped form is seen.

Color. The colony, in alcohol, is a light brown with a faint reddish cast in places.

Genus **Platycaulus** Wright and Studer.

Platycaulus Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 148.

The original definition of this genus is as follows:

"Colony branched, the branches in one plane, anastomosing. The axis is horny, flattened, with a calcareous centre and calcareous particles interspersed amid the horny layers: the nutrient canals surrounding the central axis almost as in *Plexaura*. Polyps prominent, on the sides of the stem and branches, retractile within verrucæ. Cœnenchyma moderate, like shagreen. Spicules straight and curved spiny spindles and stellate forms".

The type, and hitherto the only known species of the genus *Platycaulus* is *Platycaulus danielsseni* Wright and Studer.

1. *Platycaulus sibogæ* new species. (Plate II, figs. 2, 2*a*; Plate III, fig. 4).

Stat. 213. Saleyer Anchorage and surroundings. Up to 36 meters.

Colony flabellate, not reticulate, although there are a few anastomoses, loose and flabby in texture, 35 cm. high. Several upright stems spring from a single encrusting base. The largest of these has its main stem and many of the branches and twigs flattened. The stem forks 2 cm. from its base into two unequal branches the largest of which is 6.5 mm. × 5 mm. in section. After giving off several small lateral branches it again forks, 11 cm. from its base, and the resultant branchlets again give off irregularly disposed lateral branchlets at intervals of about 1 cm. Branches of the 6th order are sometimes attained. In a few cases the branches anastomose, but not often. The ultimate twigs are flattened, being about 2 mm. by 1 mm. in section, short, and generaly pinnate in arrangement. The calyces are usually lateral in position, but are not infrequently disposed on three sides of the smaller branches. Quite a number of the medium sized branches are round in section.

A cross section of a branch shows a rather thin cœnenchyma and a comparatively thick axis cylinder with a central white core. The water-vascular canals are not prominent.

The individual calyces are low verrucæ the margins of which are 8-lobed and do not seem capable of closing over the retracted polyps. A typical calyx measures 1 mm. to the top of the infolded mass of tentacles and is 1 mm. broad at its base. The calyx walls are filled with transversely placed slender crimson spindles which tend to an en chevron arrangement near the margin. The polyp has a well-marked collaret of similar spindles beset with sharp thorny points, and the tentacle bases bear similar crimson spindles arranged longitudinally on their dorsal surfaces. On the proximal parts of the tentacles these spindles tend to an en chevron arrangement. These spicules show in conspicuous relief against the pallid substance of the tentacles.

Spicules. These are mainly slender spindles with their surfaces often comparatively smooth and often, especially in the case of the spindles, beset with sharp thorny points. Many of these slender spindles are curved and some of them are relatively very large, attaining a length of 1.5 mm. These large spicules are generally on the surface of the cœnenchyma, where they are longitudinally disposed. I do not find any stellate forms such as are described as occurring in *Platycaulus danielsseni.*

Color. The colony is a very dark rich wine-color or dark crimson. The polyps (in alcohol) are white with crimson spicules, but they may have been yellow in life.

This species bears a superficial resemblance to *Gorgonia radula* Möbius[1], but the spicules are entirely different.

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[1] Neue Gorgoniden des Naturhistorischen Museums zu Hamburg, Jena, 1861, p. 9, pl. III.

DISTRIBUTION OF THE GORGONIDÆ COLLECTED BY THE SIBOGA EXPEDITION.

List of Stations

at which Gorgonidæ were collected by the Siboga Expedition and
the Species collected at each Station.

STATION 33. Bay of Pidjot, Lombok. 22 meters, and less. Mud, coral and coral sand. *Leptogorgia formosa.*

STATION 80. 2°25′ S., 117°43′ E. Borneo bank. From 50 to 40 meters. Fine coral sand. *Stenogorgia miniata.*

STATION 117. 1°0′.5 N., 122°56′ E. Kwandang Bay entrance, Celebes. 80 meters (chart). Sand and coral. *Stenogorgia miniata.*

STATION 213. Saleyer Anchorage. Up to 36 meters. Mud and mud with sand. *Platycaulus sibogæ.*

STATION 273. Anchorage off Pulu Jedan, East coast of the Aru Islands, (Pearl Banks). 13 meters. Sand and shells. *Lophogorgia pinnata.*

STATION 310. 8°30′ S., 119°7′.5 E. Flores Sea. 73 meters. Sand with a few pieces of dead coral. *Stenogorgia miniata, Stenogorgia studeri.*

The data given above show that all of the Gorgonidæ collected by the Siboga were taken from comparatively shallow water, the deepest haul being from Station 117 where the depth, indicated by the chart, was 80 meters.

But one species in the above list is known to occur outside of the region visited by the Siboga, and that is *Stenogorgia miniata* which was previously recorded from the West Indies, and also from the Azores from a depth of 454 meters. This is the same species which was secured from the greatest depth yielding a member of the family Gorgonidæ secured by the Siboga.

Literature cited

in the Report on the Gorgonidæ of the Siboga collection.

DELAGE et HÉROUARD. Traité de Zoologie Concrète; Tome II, 2me Partie, les Coelentérés, Paris, 1901.

DUCHASSAING DE FONTBRESSIN, P. Revue des Zoophytes et des Spongiaires des Antilles, Paris, 1870.

HICKSON, S. J. Alcyonaria and Hydrocorallinæ of the Cape of Good Hope, Cape Town, 1901.

—— Alcyonaria of the Cape of Good Hope, Part II, Cape Town, 1904.

KÖLLIKER, A. Icones Histiologicæ oder Atlas der vergleichenden Gewebelehre; 2te Abtheilung, der feinere Bau der höheren Thiere; 1stes Heft, die Bindsubstanz der Cœlenteraten; Leipzig, 1865.

MILNE EDWARDS et HAIME. Histoire naturelle des Coralliaires, ou Polypes proprement dits, I, 1857.

NUTTING, C. C. Alcyonaria of the Californian Coast. Proceedings of the U. S. National Museum, XXXV, pp. 681—727, Washington, 1909.

POURTALÈS, L. F. DE. Contributions to the Fauna of the Gulf Stream at Great Depths, 2d Series. Bulletin of the Museum of Comparative Zoology, Vol. 1, N⁰ 7, Cambridge, 1868.

RIDLEY, S. O. Alcyonaria of the Mergui Archipelago, 1888.

STUDER, TH. Übersicht der Anthozoa Alcyonaria, welche während der Reise S. M. S. "Gazelle" um die Erde gesammelt wurden; Monatsbericht der Königlich Preussischen Akademie der Wissenschaften zu Berlin, September und October 1878; Berlin, 1878.

—— Versuch eines Systemes der Alcyonaria; Archiv für Naturgeschichte; 51ster Jahrgang, Bd. 1, Heft I, 1887.

—— Alcyonaires provenant des Campagnes du Yacht l'Hirondelle (1886—1888). Résultats des Campagnes scientifiques accomplies sur son Yacht par Albert 1er, Prince Souverain de Monaco, Fascicule XX; Monaco, 1901.

VALENCIENNES, M. Extrait d'une Monographie de la famille des Gorgonidées de la classe des Polypes; Comptes rendus hebdomadaires des Séances de l'Academie des Sciences, XLI, Paris, 1855, p. 7.

VERRILL, A. E. Review of the Corals and Polyps of the West Coast of America. Transactions of the Connecticut Academy of Arts and Sciences, Vol. I, Part. 2, New Haven, 1867.

—— Critical Remarks on Alcyonoid Polyps, N⁰ 3. The American Journal of Sciences and Arts, XLVII, New Haven, 1869.

—— Report on the Anthozoa, and on some additional Species dredged by the Blake in 1877—1879, and by U. S. Fish Commission Steamer Fish Hawk in 1880—1882. Bulletin of the Museum of Comparative Zoology at Harvard College, Vol. XI, N⁰ 1, Cambridge, 1883.

WRIGHT, E. P. and STUDER, TH. Report on the Alcyonaria collected by H. M. S. Challenger during the years 1873—76. The Voyage of H. M. S. Challenger, Zoology, Vol. XXXI, London, 1889.

EXPLANATION OF PLATES

The photographs were made from nature by the author.
The spicules were drawn under the camera lucida by Mr. Dayton Stoner.

PLATE I.

Fig. 1. *Lophogorgia pinnata* n. sp. Natural size. 1 *a*, part of branch × 5.
Fig. 2. *Leptogorgia formosa* n. sp. Natural size. 2 *a*, part of branch × 5.

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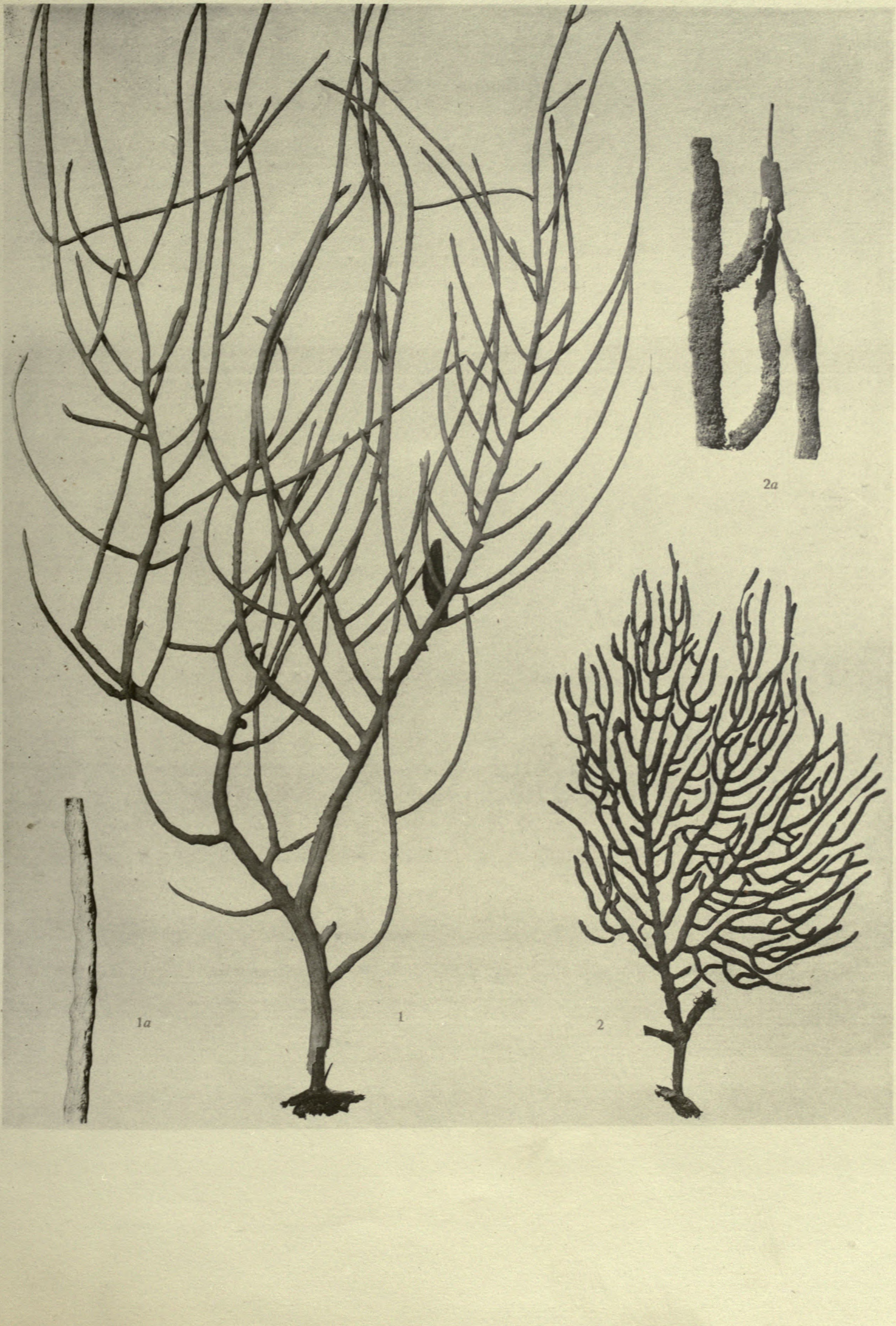

PLATE II.

Fig. 1. *Stenogorgia studeri* n. sp. Natural size. 1 *a*, part of branch × 5.

Fig. 2. *Platycaulus sibogæ* n. sp. Natural size. 2 *a*, part of branch × 5.

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CALIFORN

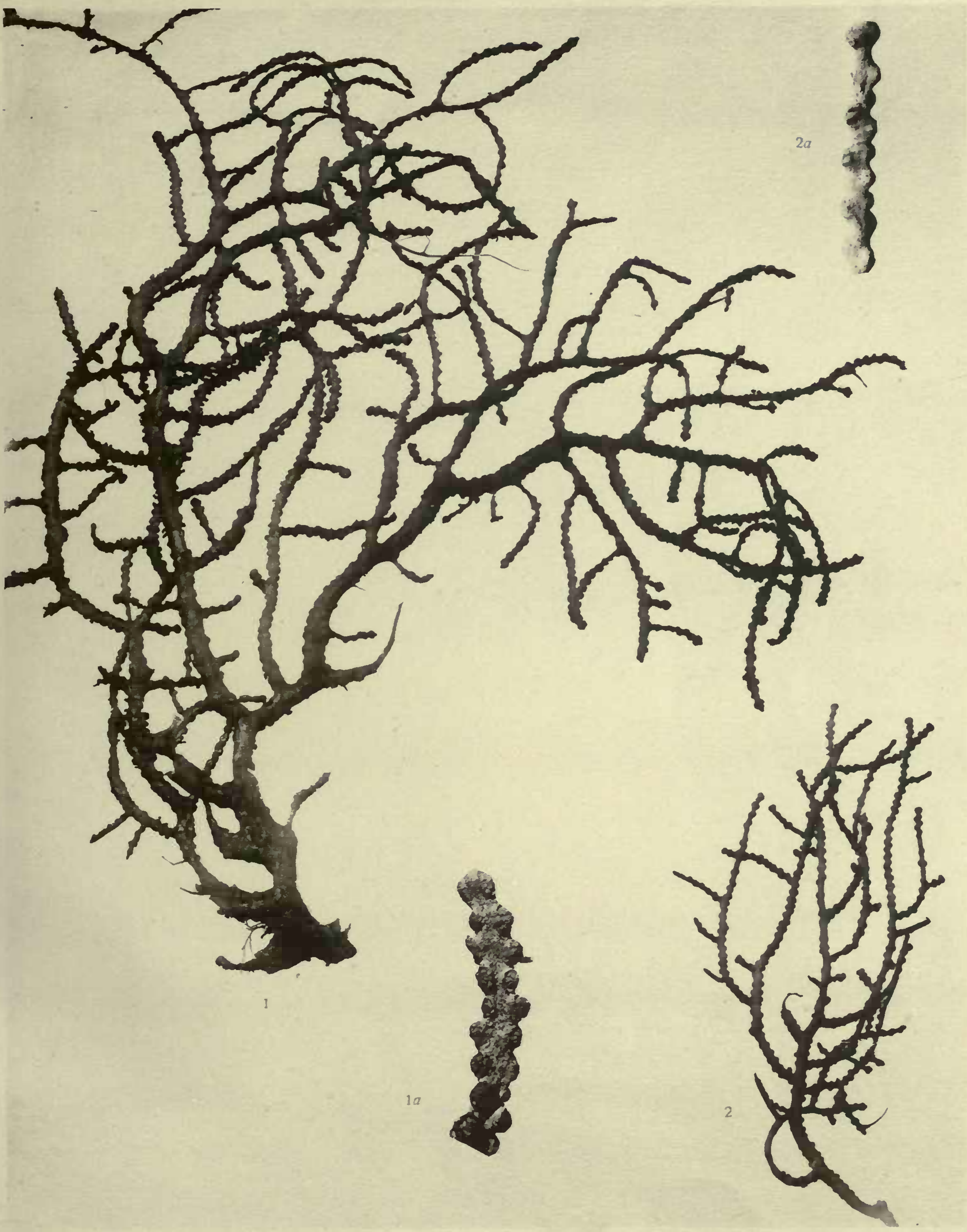
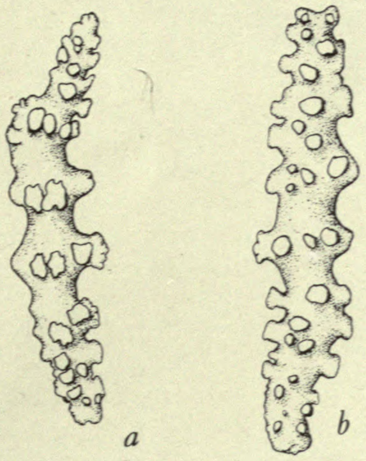


PLATE III.

Fig. 1. *Lophogorgia pinnata* n. sp. Group of 2 spicules, *a* and *b* × 350.
Fig. 2. *Leptogorgia formosa* n. sp. Group of 4 spicules, *a*, *b*, *c* and *d* × 250.
Fig. 3. *Stenogorgia studeri* n. sp. Group of 5 spicules, *a*, *b*, *c*, *d* and *e* × 120.
Fig. 4. *Platycaulus sibogæ* n. sp. Group of 4 spicules, *a*, *b*, *c* and *d* × 120.



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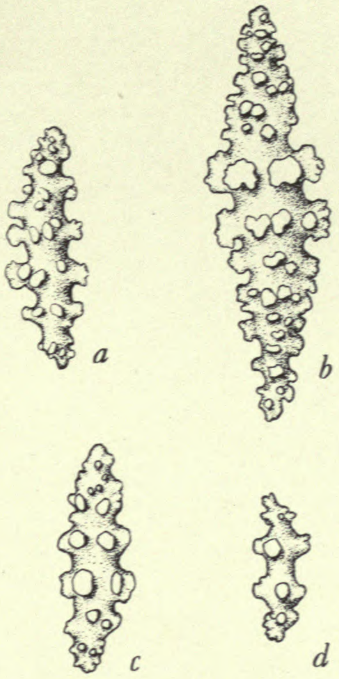

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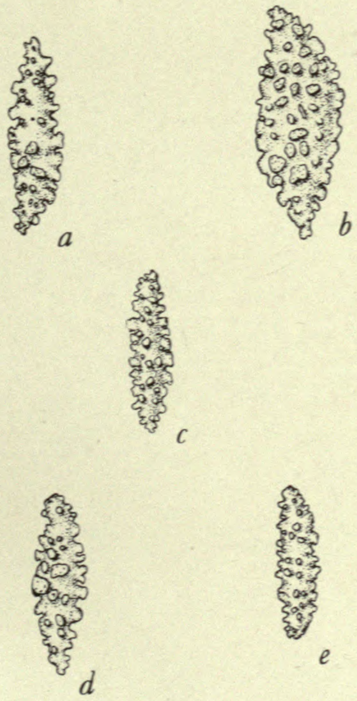

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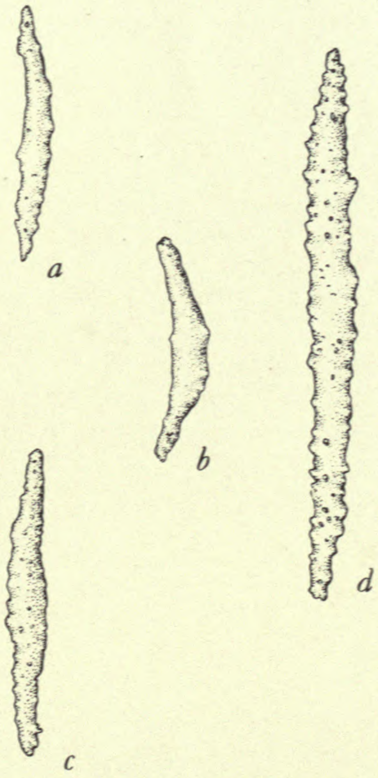

4

Dayton Stoner del.

ERRATUM

Monographie 40: Loman, Die Pantopoden der Siboga-Expedition, 1908, S. 66.

Die neue *Pallenopsis*-Art (*P. plumipes*) hat leider irrtümlich denselben Namen erhalten wie die bereits früher von Meinert (Den Danske Ingolf-Expedition, V. 3, 1899, Pycnogonida, p. 51) aus dem Nord-Atlantik beschriebene Tiefsee-Species.

Demnach muss die von der Siboga-Expedition aus der Kwandang-Bai in Nord-Celebes gedredschte Art einen andern Namen bekommen, und ich schlage jetzt vor sie

Pallenopsis Sibogae nom. nov.

zu nennen.

Amsterdam, Mai 1911.

J. C. C. Loman.

THE GORGONACEA OF THE SIBOGA EXPEDITION

VIII. THE SCLERAXONIA

Siboga-Expeditie
XIII b^5

THE
GORGONACEA OF THE SIBOGA EXPEDITION

VIII. THE SCLERAXONIA

BY

C. C. NUTTING
Professor of Zoology, State University of Iowa

With 12 plates

(Aided by a grant from the ELIZABETH THOMPSON SCIENCE FUND)

LATE E. J. BRILL
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Section SCLERAXONIA Studer.
(= PSEUDAXONIA von Koch.)

Scleraxonia Studer. Versuch eines Systemes der Alcyonaria, 1888, p. 24.

The definition of this section of the Gorgonacea, as given by STUDER, is indicated in the following translation:

"Fixed, upright branched colonies in which the short polyp cavities are immersed in a canal-bearing cœnenchyma which contains numerous embedded spicules. The branches consist of a cortical substance containing the polyps and a medullary substance which contains spicules of different forms from those of the cœnenchyma, densely aggregated and either connected by a horny substance or bound together by a limestone substance into a stony axis in which the individual spicules are plainly evident".

This definition, although correct, may be considerably shortened without losing its effectiveness. Leaving out unessentials, the following will serve our purpose:

Gorgonacea with an axis in which the individual spicules can be recognized and in which they are connected into a more or less compact mass either by a horny substance or calcareous matter.

Although there is some intergradation between the Briareidæ on the one hand and the Gorgonellidæ, a holaxonian family, on the other; and although there is evident relationship between the Isidæ, another holaxonian family, and the Melitodidæ, this Section is of practical use in a treatment of the Gorgonacea and serves to segregate that great order into two groups which are fairly natural.

Family BRIAREIDÆ Gray.

Briaracées (in part) Milne Edwards et Haime. Histoire Naturelle des Coralliaires, 1857, p. 188.
Briareidæ Gray. Annals and Magazine of Natural History, Vol. IV, 1859, p. 443.
Briareidæ Verrill. Memoirs Boston Society of Natural History, I, 1863, p. 10.
Paragorgiaceæ Kölliker. Beiträge zur Kenntniss der Polypen, 1870, p. 11.
Briaridæ Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 26.
Briareidæ Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXI.
Briareidæ Bourne. A treatise on Zoology, part II, Chapter VI, 1900, p. 25.
Briareidæ Nutting. Alcyonaria of the Hawaiian Islands, 1908, p. 569.

MILNE EDWARDS and HAIME (1857) defined the "Briaracées" as follows:

"Polypieroide dont l'axe est occupé par un tissu subéreux ou spiculifère, ou par une cavité vide".

In accordance with this definition these writers included in the family the genera *Briareum*, *Solanderia*, *Paragorgia* and *Cœlogorgia*, the last of which, *Cœlogorgia* is not now regarded as belonging in the Scleraxonia.

GRAY (1859) defines the family *Briareidæ* as follows:

"Coral arborescent, fleshy, supported by a central axis formed of numerous intertwined fusiform spicules". This writer includes but one genus, *Briareum*, in the family.

VERRILL (1867—71) includes the genera *Briareum*, *Paragorgia*, *Titanidium* and, tentatively, his genus *Callipodium* which is not now regarded as belonging to the Gorgonacea at all.

KÖLLIKER (1870) practically adopts the definition of MILNE EDWARDS and HAIME, but leaves off the last part "ou par une cavité vide", thus excluding *Cœlogorgia*. He divides the family into two sections, "Sympodidæ" with an encrusting cœnenchyme and "Paragorgiaceæ" in which the branched colony exhibits a differentiated cortical and nuclear portion or axis. This second section is practically identical with the *Briaraceæ* as at present accepted.

STUDER (1887) offers a definition which has stood without essential modification until the present time, and a translation of which appeared in the Challenger Report, the Alcyonaria, 1889, as follows:

"Scleraxonia in which the cœnenchyma consists of a polyp-bearing cortex and a medullary substance of closely packed spicules; these are either developed on the surfaces of an upright shrubby colony, or the latter is relegated to the interior of a cylindrical stem over which is spread the former. In the latter case a more or less well-defined axis is formed which may be penetrated by nutritive canals, or may be quite without them".

The *Briareidæ* thus fall into two sub-divisions Briareinæ and Spongioderminæ.

All of the material of this family collected by the Siboga Expedition belongs to the subfamily Briareinæ. *Icilogorgia*, which has been placed by STUDER in the Spongioderminæ, has well-marked water-vascular canals in the axis and must therefore be included in the Briareinæ.

A definition which will sharply differentiate the family Briareidæ from Sclerogorgidæ, and at the same time give the necessary diagnostic features, is offered as follows:

Scleraxonia in which the spicules of the axis cylinder are either beset with distinct thorny points or wart-like verrucæ and are not possessed of horny sheaths by which they are agglutinated together either directly or by cross connections. Branches consisting of a cortex containing the calyces and an axis consisting of spicules closely packed in a matrix of connective tissue.

The amount of material collected by the Siboga Expedition and belonging to this family is hardly sufficient to justify a general discussion of the generic groups. The writer will therefore confine himself to a discussion of the genera represented.

Synoptic view of the genera and species of BRIAREIDÆ collected by the Siboga Expedition.

New species are indicated by an asterisk (*).

Solenocaulon.

Solenocaulon sterroklonium, *S. grayi*, *S.* **querciformis*, *S.* **jedanensis*.

Titanidium.

Titanidium **friabilis*.

Semperina.

Semperina rubra, *S.* **brunnea*.

Suberia.

Suberia köllikeri, *S.* **excavata*, *S.* **macrocalyx*.

Paragorgia.

Paragorgia splendens.

Iciligorgia.

Iciligorgia orientalis.

Systematic description of genera and species.

Genus **Solenocaulon** Gray.

Solenocaulon Gray. Annals and Magazine of Natural History, Series 3, Vol. X, 1862, p. 147.
Solenocaulon Genth. Zeitschrift f. wissenschaft. Zoologie, Bd. 17, 1867, p. 428.
Solenocaulon Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 668.
Solenocaulon Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXI.
Solenocaulon Brundin. Alcyonarien aus der Sammlung des Zool. Museums in Upsala, 1896, p. 12.
Solenocaulon Germanos. Gorgonaceen von Ternate, 1897, p. 145.
Solenocaulon Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 412.
Solenocaulon Hickson. Alcyonaria of the Maldives, part I, 1903, p. 493.
Solenocaulon Thomson and Simpson. Alcyonaria of the Indian Ocean, II, 1909, p. 153.

Gray (1862) gives a somewhat lengthy generic description accompanied by a good figure of the type species. His description is as follows:

"The coral coriaceous, tubular, circular, and simple below, compressed, subquadrangular, tortuous, and more or less branched above, the branches being similar in size and form to the main stem. The main stem and branches furnished with more or less elongate, subsolid, slender branches, which are placed on the edge of the large holes in the main stem and branches which communicate with the main tube. These branchlets, (and sometimes the branches at the base of them) are furnished with large cells for the polyps, which are placed in one (more frequently in two) series on each side of the branchlets. The polyp cells are rather large, circular, nearly superficial, and furnished with a cup divided into eight conical connivent lobes, each lobe being formed of some transverse spicules at the base and some obliquely-placed spicules diverging from each lateral edge toward the top above".

Studer (1878) simply quotes the definition given above and, in 1887, gives a lengthy description which is translated in the Challenger Report (1889). This may be condensed as follows:

Colony with a flattened stem bearing polyps on its margins and one face. Cœnenchyma of two layers, cortical and medullary. Cortex with spicules varying from spindles to club-shaped; thick and polypiferous on one side of the axis, thin and barren on the other. The medullary portion has a very thin cortical layer and bears no polyps. Medullary mass consisting of closely approximated rod-like spicules united by horny material. Stem and branches inrolled on the side which does not bear polyps. It thus happens that in the stem and larger branches the margins will often touch so as to form a hollow tube, while the smaller twigs only exhibit a channeled stem.

Germanos (1897) discusses this genus at considerable length and divides it, very strangely, into two sub-genera on the basis of the presence or absence of a stem. The present writer agrees with Hickson, and Thomson and Simpson in regarding this division as unwarrented, especially as he (Germanos) includes *Solenocaulon tortuosum* in his subgenus Malacosolenocaulon, which is characterized as without a stem, when the figure given by Gray in connection with his original description of that species shows an undoubted stem. Germanos added three new species to the genus, i. e. *Solenocaulon sterroklonium*, *S. diplocalyx* and *S. akalyx.*

Hickson (1903) made a somewhat extended study of numerous specimens of this genus and concluded that *Solenocaulon tortuosum* Gray, *S. grayi* Studer, *S. tubulosa* Genth, and *Leucoëlla cervicornis* (Gray) all belong to the same species, *S. tortuosum*, and supports his thesis by what seems a somewhat labored argument regarding the action of parasitic or symbiotic crustaceans on the growth of these forms. He then adds a new species, *S. ramosa*, which seems to be established on much the same sort of characters as are the species which he discards.

Thomson and Simpson (1909) recognized two valid species, *S. sterroklonium* and *S. tortuosum* among the specimens collected by the "Investigator" in the Indian Ocean. These writers also point out the inconsistency of Hickson in establishing his species *S. ramosa* "when the only diagnostic feature seems to be the tunnel-like expansions".

The present writer feels that there is little gained by substituting such terms as subspecies, varieties or "facies" for specific names, and is further of the opinion that it is impracticable to regard as "good species", in the Metazoa, those forms only which do not intergrade. The cœlenterata especially seem to be in such a plastic condition that extreme variation is common, and absolutely exclusive definition of species impracticable. In view of such conditions it seems best to regard a genus as simply a group of species more closely allied to each other than to other groups, and a species as a group of individuals more nearly allied to each other than to other similar groups, even if some degree of intergradation is shown.

The type species of this genus is *Solenocaulon tortuosum* Gray. Other species that have been described[1] are *Solenocaulon cervicornis* (Gray), *S. akalyx* Germanos, *S. diplocalyx* Germanos, *S. grayi* Studer, *S. sterroklonium* Germanos, ? *S. simplex*[2] Brundin, *S. tubulosum* Genth and the new species described in the following pages.

1. *Solenocaulon sterroklonium* Germanos.

Solenocaulon sterroklonium Germanos. Gorgonaceen von Ternate, 1897, p. 151.
Solenocaulon tortuosum (in part) Hickson. Alcyonaria of the Maldives, 1903, p. 495.
Solenocaulon tortuosum Thomson and Simpson. Alcyonaria of the Indian Ocean, II, 1909, p. 157.

Stat. 49^a. 8° 23′.5 S., 119° 4′.6 E. 69 meters. Coral and shells.
Stat. 80. 2° 25′ S., 117° 43′ E. From 50 to 40 meters. Fine coral sand.
Stat. 154. 4° 7′.2 N., 130° 25′.5 E. 83 meters. Grey muddy sand, shells, Lithothamnion.
Stat. 240. Banda Anchorage. 9 to 45 meters. Black sand, coral.
Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 meters. Sand and shells. Stones.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 meters. Sand, coral and Lithothamnion.
Stat. 285. 8° 39′.1 S., 127° 4′.4 E. 34 meters. On the limit between mud and coral.
Stat. 318. 6° 36′.5 S., 114° 55′.5 E. 88 meters. Fine yellowish grey mud.
Stat. 319. 6° 16′.5 S., 114° 37′ E. 82 meters. Fine yellowish grey mud.
Stat. 320. 6° 5′ S., 114° 7′ E. 82 meters. Fine grey mud.

Colony plumiform, 40.5 cm. in height and with a spread of 3.7 cm. The stem is about 14 cm. long, flattened proximally and distally and round on other portions, basal expansion 1.1 cm. × 3 mm. in cross section, distal expansion semicircular in section, the flat face being anterior and about 7 mm. in diameter, and the round portion of stem 6 mm. in diameter. The upper part of the stalk appears to have born leaves which have dropped off. The branched part of the stem, corresponding to the rachis of pennatulids, bears a number of broad, usually opposite, greatly expanded leaves which bend around toward the front where they meet and coalesce, forming about 8 bands or girdles enclosing a tunnel-like passage along the front of the stem. These passages are inhabited by a macrouran crustacean, and vary from 9 to 17 mm. in width, measuring at their narrowest part in front. The branches give forth from their edges flattened branchlets which are narrow distally and become round in section, often measuring about 1 mm. in diameter. The distal part of the rachis is much flattened and ends in a frilled lobate expansion. The calyces are pretty evenly and regularly distributed along the edges of the leaves and their various expansions and processes, but there are also a few scattered ones on the anterior surfaces of the girdles.

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[1] The present writer does not feel that he is in a position to decide on the validity of species of this genus which he has not had an opportunity to study.

[2] In the case of *Solenocaulon simplex* the writer has entertained a serious doubt as to the validity of the species because there is nothing either in the description or figure to separate it from other yonng species of the genus. See BRUNDIN, Alcyonarien aus der Sammlung des zoologischen Museums in Upsala, 1896, p. 9.

The individual calyces are in the form of short cylinders when the polyp is expanded and, rounded domes when it is retracted. A typical one measures about 1.6 mm. high and 1.8 mm. broad. The calyx walls are filled with small spindles which are horizontally disposed basally and vertically disposed distally. The margin is ornamented with 8 angular points formed by the converging ends of spindles. The polyps are many of them well expanded, white in color, their walls with 8 series of horizontal spicules which are curved to fit the contour of the walls. Below the tentacle bases these spindles are arranged en chevron and rise in 8 points corresponding to those of the calyx margin; each point being composed of the distal ends of several spindles. The dorsal surface of each tentacle bears a symmetrical closely set double row of spindles arranged en chevron, but with their points directed toward the bases of the tentacles. There are 10 to 12 pairs of pinnules to each tentacle. A fully expanded polyp (in alcohol) measures 5 mm. in spread, across the tentacles.

There is a well-marked axis composed of a densely aggregated, felted mass of very slender needle-like or rod-like spindles with their surfaces ornamented with scattered thorny points. Mixed with these is a much less numerous form which is entirely different, being much larger, very stout, sometimes oval spindles with remarkably coarse and irregular verrucæ.

Spicules. These have been described. Those of the axis are remarkably slender, rod-like, comparatively smooth, but with scattered thorny points; and a few strikingly dissimilar oval or irregular spindles with coarse verrucæ. These two types are also found in the cœnenchyma of the branches; but here the larger spicules are slender, comparatively regular spindles with ordinary verrucæ. The cœnenchyma contains many of the irregular oval spindles found sparingly in the axis. There are also slender spindles in the calyces.

Color. The leaves are bright scarlet, the polyps white, the stem and rachis rather dull pink and the flattened basal part of stem very light pinkish or livid.

General distribution. Type locality. Ternate, also reported from the Maldives and the Indian Ocean.

This species is quite variable in color. Some of the specimens are white with pink calyces, and others are creamy white with brownish or salmon colored calyces. One young specimen from Station 319 is much like the colored figure of the original described by Germanos.

2. *Solenocaulon grayi* Studer.

Solenocaulon grayi Studer. Monatsbericht der Königl. Akademie der Wissenschaft. zu Berlin, 1878, p. 671.

Solenocaulon thomsoni (in part) Hickson. Alcyonaria of the Maldives, part I, 1903, p. 497.

? *Solenocaulon tortuosum* (in part) Thomson and Simpson. Alcyonaria of the Indian Ocean, II, 1909, p. 160.

Stat. 47. Bay of Bima, near South Fort. 55 meters. Mud with patches of fine coral sand.

Stat. 51. Madura Bay and other localities in the southern part of Molo Strait. 69 to 91 meters. Fine grey sand, coarse sand with shells and stones.
Stat. 114. 0° 58'.5 N., 122° 55' E. 75 meters. Hard sand, very fine.
Stat. 117. 1° 0'.5 N., 122° 56' E. 80 meters. Sand and coral.
Stat. 162. Between Loslos and Broken Islands, West coast of Salawatti. 18 meters. Coarse and fine sand with clay and shells.

Colony complete with the exception of the basal end of the stem, 44.5 cm. high. The stem is unbrached for 16 cm. of its length and its basal portion has been worn or cut away on one side so as to give it an appearance of being flattened although it is otherwise nearly round, 1 cm. in diameter, with a channel or groove on one side and a number or longitudinal irregular corrugations on its surface. The stem forks 16 cm. from its base into two rather unequal branches. One of these is gutter-shaped throughout, being convex on its dorsal and concave on its ventral aspect, with the exception of one "girdle" 1.5 cm. broad. The other, and larger, branch is solid and round in section for 6.5 cm. from the base, beyond which it is alternately guttered and partly girdled, the girdles in places being so extensive as to form long tunnels or arcades, in one case 4.1 cm. long. Both of the main branches give off numerous lateral branchlets which are greatly expanded basally and curve forward and then inward to meet and coalesce, thus forming the girdles or arcades. The branches bear many simple and a few compound branchlets alternately disposed. All of the ultimate branchlets are much flattened and more or less guttered, the guttering sometimes disappearing on the distal ends near which the twigs have a cross section of about 3.5 mm. × 1.7 mm.

The calyces are practically all lateral in position, being usually in fairly regular rows along the edges of the branches and branchlets. There are also a few groups of scattered calyces on the front surfaces of the girdles and arcades.

The individual calyces are very low conical verrucæ, a typical one measuring 1.2 mm. in height and 2 mm. in diameter at the base, and are from 2 to 3 mm. apart from centre to centre. Their walls are filled with vertically disposed spindles which tend to form 8 low marginal points which are much more evident than in *Solenocaulon sterroklonium*. The polyps are retractile, but in the specimen described stand as much as 2 mm. above the calyx margin. The basal part of the polyp body is armed with transverse spicules which higher up are en chevron and still higher lie in vertical bands, 8 of which surround the margin and encroach upon the tentacle bases. The distal parts of the tentacles are covered with a complete armature consisting of two series of delicate spicules with serrated edges, the series meeting on the mid-dorsal surfaces of the tentacles and extending obliquely forward, outward and downward, ending in a line with the bases of the pinnules. The polyp spicules are lighter and more jagged than those of *S. sterroklonium*, and the polyp seems more slender and delicate.

A cross section of a stem shows an outer layer of comparatively heavy and disk-like, sometimes almost globular, spicules covered with coarse verrucæ. The water-vascular canals are around the periphery of the axis and appear in section as regular oval openings. The axis is a felted mass of slender rod-like and needle-like spindles whose surfaces bear short thorny spines which are more prominent and numerous than in *S. sterroklonium*. The cœnenchyma of the branches is filled with rather slender spindles which intergrade on the one hand with rod-like forms beset with thorny points, and on the other with typical spindles with ordinary verrucæ in regular whorls. A few true clubs are also seen, and an occasional branched spindle. Many of the slender spindles are bent in an arc, and some are doubly curved.

Color. The colony is a light tan brown, the polyps differing but little from the cœnenchyma.

General distribution. Type locality. Northwest Coast of Australia, 50 fathoms. This species is also reported from the Indian Ocean.

The writer finds himself unable to agree with the opinion expressed by HICKSON, and THOMSON and SIMPSON that this species is identical with *Solenocaulon tortuosum*. The absence of the Y-shaped spicules regarded by THOMSON as characteristic of *S. tortuosum* seems a good specific character. The basal part of the stem in the type specimen was missing, hence the oval spicules were not described by GRAY.

3. *Solenocaulon querciformis* new species. (Plate I, fig. 1, 1*a*; Plate XI, fig. 1).

Stat. 142. Anchorage off Laiwui, coast of Obi Major. 23 meters. Mud. (Young specimen).
Stat. 284. 8°43'.1 S., 127°16'.7 E. 828 meters. Grey mud. (Type specimen).

Colony dendritic in form, but somewhat flabellate, 23.5 cm. in length. A stem 14 cm. long, found in the same bottle, appears to belong to the same specimen. If so, the colony was 37.5 cm. in length. The stem and all branches except the ends of the twigs are strongly flattened, the larger branches being coarsely and deeply furrowed lengthwise, but in a slightly spiral manner, these furrows being numerous and conspicuous. The stem measures 9.5 mm. × 7 mm. in section. The first branch is short and flat and soon coalesces with a larger one above it. A large branch is given off a little above the first and on the opposite side. This is much flattened, distorted and furrowed, and gives off numerous, usually lateral branchlets which are laterally expanded at their origins and are turtuous, like the branches of an oak tree, and sometimes give off branchings of the third order. The main stem gives off two other large branches which are greatly expanded laterally and also at the bases of the branchlets, and bear a series of unequal grooves and furrows at the front and back. The largest of these main branches is 9 mm. × 6 mm. in section near its base. After giving off these main branches the stem pursues an undulating course, giving off irregular lateral branches and breaking up at its distal end into a tuft of branchlets which re-divide until branchings of the 5th order are attained, the whole forming a clump of aggregated branchlets. The ultimate twigs are usually quite round in section, having a diameter of about 1.3 mm. The calyces are confined mostly to the smaller branches and twigs where they are usually lateral in position and rather distant, being about 3 mm. apart on the average.

The individual calyces are conical in form and vary greatly in size. A typical one measures 1.5 mm. in height and about the same in diameter. They are often slightly inclined toward the distal ends of the twigs. Their walls are filled with vertically disposed spindles. The polyps seem to be but partially retractile and most of them rest with their very heavy collarets on the calyx margin. The collaret is composed of 8 to 10 rows of transverse spindles, the upper two or three rows curved, so that they form an en chevron arrangement on the tentacle bases. Still higher up on the basal part of the tentacles the spicules are arranged in longitudinal groups, one to each tentacle, each group forming a jagged point. Above these points the tentacles curve inward and their dorsal surfaces are armed with a double row of slender spindles, each row extending from near the mid-dorsal surface of a tentacle to near the pinnule bases.

A cross section of a stem shows a comparatively thin cœnenchyma with an ill-defined circlet of water-vascular canals around the periphery of the axis. The axis is composed of very slender rod-like or needle-like spindles with distant thorny points immersed in a horny matrix, and is penetrated with conspicuous water-vascular canals of irregular size.

Spicules. Those of the cœnenchyma of the stem are small, rounded, disk-like, or compact irregular forms with prominent and irregularly disposed verrucæ. Those in the axis are very slender rod-like forms which are smooth on the greater part of their surface, bearing distant thorny points and longitudinally disposed, forming a felted mass immersed in a horny matrix. The spicules of the cœnenchyma of the branches and of the calyx walls are mainly spindles of various forms, usually with irregularly disposed verrucæ. All intergradations between the forms described above are seen.

Color. The colony is light yellowish brown or tan color.

This species differs from all the others described in this genus in having all of the branches solid and without tunnels or belts inhabited by symbiotic crustaceans.

A label in the jar in which this specimen was found bears the word "*Spongioderma*"? In all essential characters, however, it seems to be a *Solenocaulon*. The axis is penetrated by conspicuous water-vascular canals, and this character would prevent its being placed in the "*Spongiodermince*" of WRIGHT and STUDER.

Some fragments from station 142 are referred with doubt to this species. They are evidently from a young specimen. The stem and basal parts of branches are grooved and show a tendency to flattening. The calyces are rather distant and prominent. The polyps agree with the type in spiculation.

4. *Solenocaulon jedanensis* new species. (Plate II, figs. 1, 1*a*; Plate XI, fig. 2).

Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 meters. Sand, small stones and shells.
Stat. 273. Anchorage off Pulu Jedan, East Coast of Aru Islands. 13 meters. Sand and shells. (Type locality).

Colony (base lacking) pinnate in general form, 16.5 cm. in height and with a spread of 4.8 cm. The main stem is oval in section, measuring 11 × 8 mm. 4.6 cm. above its proximal end it becomes tubular and gives off short tubular branches ending in small flattened, sometimes round, twigs. The tubular part of the main stem is compressed; but 9.4 cm. from its base it looses its tubular character and becomes alternately deeply channeled and belted, there being three belts about 1 cm. broad and three deeply channeled portions. The branches tend to be lateral and alternate in position. They each have a short broad tubular basal part and each of these tubular parts bears a long projection from its distal end. These projections are sometimes lobular, sometimes narrow and flattened, and sometimes round in section. They are exceedingly irregular in disposition and are usually simple, but may bear short irregular branchlets. The calyces are born almost exclusively on these processes and are always lateral in position, where they are in one broken row, or two rows, on each side of twigs.

The individual calyces are almost entirely included, appearing as very low swellings with hardly appreciable height and a diameter of about 2 mm. Their apertures are surrounded by eight not very pronounced lobes filled with longitudinally disposed tuberculate spindles. The polyps are entirely retractile and in this specimen are withdrawn well below the margins, which close over them. They have their walls armed with curved transverse spindles below and spindles arranged en chevron towards the upper part and on the tentacle bases. Above this the tentacles are armed with longitudinal spindles, and their distal parts are bent abruptly inward and bear two rows of small spindles arranged en chevron and reaching to the bases of the pinnules.

A cross section of the stem shows the cœnenchyma filled with discs and rounded, heavily tuberculate spindles. The water-vascular canals are large and conspicuous, a number of them traversing the axis. The latter consists of a felted mass of slender rods and needles longitudinally disposed and bearing thorny points.

Spicules. These have already been partly described. Besides the slender forms in the axis there are oval and round, heavily warted spicules in the general cœnenchyma and the outer layer of calyx walls; and heavy, coarse tuberculate clubs and spindles of the inner wall of the calyces. Curved, moderately heavy spindles are abundant in the polyps, and much more slender and smaller ones in the tentacles. There are no Y-shaped forms.

Color. The colony is a rather light brown. Other specimens are darker brown.

This species seems distinct from the others, particularly in the spiculation of the calyx walls. It bears considerable resemblance to *Solenocaulon tortuosum*, but lacks the peculiar Y-shaped spicules which Thomson and Simpson regard as characteristic of this species[1]. Some of the specimens bear symbiotic brachyuran crabs, instead of the Macroura found in other species.

Genus **Semperina** Kölliker.

Semperina Kölliker. Beiträge zur Kenntniss der Polypen, 1870, p. 9.
Semperina Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 28.
Semperina Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXII.

In the original description of the genus *Semperina* Kölliker gives a detailed account of the species, *Semperina rubra* in which specific and generic characters are in no wise differentiated. A diagnosis can, however, be gathered from his analysis of the genera of his "Paragorgiaceæ" (pp. 11 and 12) as follows:

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[1] Aleyonarians of the Indian Ocean, II, 1909, p. 155.

Colony branched, the stem and branches having well differentiated cortical and nuclear portions, the latter forming an axis which is penetrated by large water-vascular canals. Polyps only partially retractile. Stem cylindrical.

STUDER (1887) considers this genus to be closely related to *Solenocaulon* and defines it as shown in the following translation:

"But here the stem has a more cylindrical form and the nuclear mass withdraws more to the axis of the colony although it is always excentric and the polyps, as in the previous genus, are situated mainly on one side of the stem and branches".

This definition is repeated by WRIGHT and STUDER in their Challenger Report (1888) and is adopted for the present work.

The type and, up to the present time, the only known species of the genus is *Semperina rubra* Kölliker. One new species is added in the present work.

1. *Semperina rubra* Kölliker.

Semperina rubra Kölliker. Beiträge zur Kenntniss der Polypen, 1870, p. 9.

Stat. 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral.

Colony incomplete, straggling in habit, 13.5 cm. in height. The main stem is hollowed, probably by some parasite or pathological condition, and probably flattened naturally, 2.3 cm. long to first forking and 1 cm. in greatest diameter. One of the main branches is simple, irregularly flattened, (a cross section near its base being 7 mm. × 4 mm.) and somewhat spirally twisted. The other main branch bears a number of very irregular mostly lateral branchlets projecting in an erratic manner from the main branch. One of the apparent branchlets is really a branchlet from a missing part of the colony which has anastomosed with the part secured. All of the branchlets are simple, most of them round in section and clavate at the ends. The calyces are distributed on three sides of the branches, with a marked tendency to aggregate in groups or clumps on one face of the branch or on the ends of the branchlets.

The individual calyces are almost entirely included in the cœnenchyma and appear as very low verrucæ about 2 mm. in diameter and with scarcely appreciable height. The polyps seem to be non-retractile, at least all are expanded in the specimen studied. They are very heavily spiculated, there being an unusually broad and heavy collaret of encrusting spindles which assume an en chevron arrangement just below the tentacle bases. The proximal part of the tentacles are covered with longitudinal spindles in several rows, and the distal parts are completely covered dorsally with spindles arranged in two series placed en chevron and reaching to the bases of the pinnules.

A cross section of a branch shows a rather thin cœnenchyma in which is embedded a regular circlet of water-vascular canals around the periphery of the axis. The axis is flattened and penetrated by a number of conspicuous water-vascular canals.

Spicules. These are exceedingly varied in form, but most of them are modifications of the simple spindle. The spindle forms range from excessively slender rods with smooth surfaces or very distant thorn-like projections to proportionally very heavy and coarse spindles with surfaces covered with coarse, irregularly warty tubercles. There are also many oval spicules, such as are common in this family, true clubs and a few irregularly branched forms.

Rarely, girdled spindles and irregular crosses are seen, such as are figured by KÖLLIKER, the original describer of the species.

Color. The colony is a dark, rather deep red; the polyps yellowish and the spicules red and white.

General distribution. Type locality, "Bohol", KÖLLIKER.

Another specimen from the same station is pale in color and some of the polyps are completely retracted.

2. *Semperina brunnea* new species. (Plate II, figs. 2, 2*a*; Plate XI, fig. 3).

Stat. 273. Anchorage off Pulu Jedan. 13 meters. Sand and shells.
Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 meters. Sand, small stones and shells.

The colony is branched, rudely flabellate in form, 20.5 cm. in height and with a spread of about 8 cm. The base is lacking. The main stem is approximately round in section, 4.8 cm. long to first branch, and 8 mm. in diameter. After giving off three stubs of branches it sends off a compound branch with four branchlets. 1.5 cm. above this it forks into two approximately equal branches each of which again branches dichotomously, one quite regularly so, until branchings of the 4th order are attained. All of the branches are round in section and more or less clavate at the ends. The main branches are about 5 mm. in diameter, the secondary branches about 4 mm., and the distal twigs 3 mm. At some of the furcations on the distal parts of the colony there is a membrane-like expansion or web of the cœnenchyma which fills in the angle sometimes as much as 8 mm. above the actual angle of the fork. The calyces are on three sides of the stem and branches, leaving the fourth side comparatively bare. On the other three sides the calyces are thickly and regularly implanted about 1.3 mm. apart.

The individual calyces are low dome-shaped verrucæ which vary greatly in height with the degree of expansion of the polyps. A typical one measures 2 mm. in diameter, and the upper parts of the walls are strongly 8-lobed and covered with coarsely tuberculate spindles and short oval forms. The polyps are completely retractile and very strongly spiculated. The collaret is composed of about 6 rows of encircling spindles which assume an en chevron arrangement on the tectacle bases. The distal part of each tentacle bears a strong band of longitudinal spindles which seem to encrust it to its tip.

Spicules. These are of the usual type for the genus. The axis bears relatively few long slender rod-like forms with distant spiny points, and relatively numerous strongly tuberculate spindles in which the tubercles are fairly distant on the slender forms and much crowded and irregular on the stouter forms. These intergrade with stout oval spindles covered with a compact mass of tubercles. The spicules of the cœnenchyma do not differ appreciably from those of the axis.

A cross section of the stem shows a not very well defined axis, a relatively thin cœnenchyma, a series of water-vascular canals around the axis, and few if any large canals penetrating the axis itself....

Color. The colony is a dark umber brown, lighter on the side devoid of polyps. A much larger specimen than the one described, from Station 273, is yellowish in color from a sponge which covers it, and the axis is penetrated by conspicuous water-vascular canals. A number of large dried specimens were also secured from the same station.

Genus **Suberia** Studer.

Suberia Studer. Monatsbericht der Königl. Akademie der Wissenschaften zu Berlin, 1878, p. 666.
Suberia Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 28.
Suberia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXII.
Suberia Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 413.

The original definition of this genus, as given by STUDER, may be translated as follows:

"Stem simple or branched, upright. Axis formed of not coalesced rod-like spicules immersed in a horny substance and without water-vascular canals. Cœnenchyma thick, containing thorny spindle-shaped spicules, Calyces large, standing at right angles from the stem, with an eight-rayed margin. Polyps with fine spindle-shaped spicules from the base to the tentacles. A circlet of longitudinal canals around the axis".

The same writer (1887) modified somewhat this definition as follows:

"In Suberia the nuclear mass is well defined and constitutes the axis of the cylindrical stems, which are slightly branched and bear polyps on all sides. Calyces aggregated, particularly on the club-shaped ends of the stems. The upper part of the polyp is retractile within a distinct calyx. A canal system of relatively large water-vascular canals penetrates the axis".

WRIGHT and STUDER (1889) give a translation of the original definition of STUDER; but STUDER's later definition, just quoted, seems preferable.

Suberia köllikeri Studer is the type of this genus. Other known species are *Suberia clavata* Studer, *S. genthi* Wright and Studer and the new species in the Siboga collection.

1. *Suberia köllikeri* Studer.

Suberia köllikeri Studer. Monatsbericht der Königl. Akad. der Wissenschaften zu Berlin, 1878, p. 667.

Stat. 297. 10°39′ S., 123°40′ E. 520 meters. Soft grey mud with brown upper layer.

Colony incomplete, consisting of a central stem and five laterally disposed branches. Length 20.3 cm. The main stem is round, varying from 6 mm. to 3.5 cm. in diameter, the latter measurement being taken near the middle of the colony. There are several knob-like swellings on the stem that may indicate new branch origins. There are three branches on one side and two on the other, all being simple except one which is forked. They vary from 1.5 cm. to 7.3 cm. in length and are about 3 mm. in diameter, except at the clavate ends which are 7.3 mm. across. These enlarged ends remind one of the genus *Paragorgia*. The calyces are irregularly distributed on all sides of the colony, being somewhat more numerous on the sides of the stem and branches and most closely aggregated on the club-like branch terminations. They vary from 3.3 mm. to 7 mm. from summit to summit.

The individual calyces are low but evident verrucæ varying greatly in size. A typical one measures 1.3 mm. in height and 3.5 mm. in diameter. There are eight sharply defined marginal lobes which close over the retracted polyps, the slit-like spaces between the lobes forming an eight-rayed star. The walls of the calyces, like the general cœnenchyma, are filled with oval, densely tuberculate spicules. The polyps are completely retractile and the dorsal surfaces of the tentacles are completely encrusted with oval, very tuberculate spicules.

A transverse section of a branch shows a comparatively thin cœnenchyma in which is a very regular series of many water-vascular canals. The axis is spongy in texture and filled with a felted mass of rather long, slender, rod-like or needle-like spindles with their surfaces ornamented with rather distant thorny points. The axis is penetrated with numerous canals of various sizes.

Spicules. The spicules are of two main types. 1st the rod-like thorny spindles of the axis. These are not so delicate as in *Solenocaulon*, and the thorns are comparatively larger. Many are spindle-shaped rather than rod-like. The second type is a minute, oval, sometimes round spicule with very prominent verrucæ which are usually arranged in symmetrical whorls and also cap the ends. Commonly there are two such whorls and two caps. Nearly all of the spicules are one or the other of these two types, or easily recognizable modifications of them.

Color. The specimen is creamy white throughout.

General distribution. Type locality. North of Three Kings Islands, North of New Zealand, 90 fathoms.

2. ? *Suberia excavata* new species. (Plate III, figs. 2, *2a*; Plate XI, fig. 4).

Stat. 142. Anchorage off Laiwui, coast of Obi Major. 23 meters. Mud.

Specimens in a very fragmentary condition. The one described is a part of a branch 3.9 cm. long and with a diameter of 8 mm. approximately round in section. The surface is almost covered with papilliform calyces resembling those of *Eunicea.*

The individual calyces are club-shaped, pointed obliquely upward and outward, averaging about 3.5 mm. long and 1.8 mm. in diameter near the distal end. They are adnate to the branch throughout their length and their margins terminate is 8 not very conspicuous lobes which are tightly closed over the retracted polyps. The calyx walls are filled with regular spindles disposed longitudinally. The polyps are entirely retractile and appear to be devoid of spicules.

A cross section of a branch shows a rather thin cœnenchyma and an axis cylinder composed of purple and deep violet spicules embedded in a horny matrix. The axis is hollow throughout the length of all of the fragments, having a tunnel apparently made by a small bivalve mollusk, one of which was found in situ. The tunnel is not round, but flat, to fit the mollusk, and the greater part of the axis has been absorbed or in some manner removed, leaving but a thin wall of the substance of the axis which thus has a flattened section which may be due to the mollusk and not a natural character.

The water-vascular canals are mostly arranged around the axis, but some of them penetrate the latter.

Spicules. Those of the axis are deep purple in color and are large strong spindles with narrow very regular whorls of blunt spines and warts. There are also triradiate forms, Y-shaped spicules and irregularly branched forms, all larger than is common in this genus. The spicules of the cœnenchyma are colorless and of much the same shape as those in the axis, spindles with numerous whorls of verrucæ being by far the most common forms, although the others are not lacking.

Color. The colony is very light yellowish brown, the axis deep purple and the polyps, or at least the tentacles, yellow.

This is the first instance in which the writer has seen a mollusk apparently living a symbiotic life in the interior of the axis cylinder of a gorgonian.

3. *Suberia macrocalyx* new species. (Plate III, figs. 3, 3*a*; Plate XI, fig. 5).

Stat. 122. 1° 58'.5 N., 125° 9'.5 E. 1264—1165 meters. Stone.

Specimen incomplete, consisting of an erect stem with short scattered branches. Length 13.5 cm. The stem and branches are round, the former 3 mm. in diameter. The first branch arises 2.6 cm. from the basal end of the stem and is simple. There are six other short simple branches irregularly disposed on all sides of the stem. Three of these, and the stem termination, end in definite swellings bearing each a clump of calyces. The calyces are irregularly distributed on three sides of the proximal parts of the stem and branches and on all sides of the distal parts of the colony. They are about 3 mm. apart on the proximal parts of the specimen and more closely approximated on the terminal twigs, where they form definite clumps or clusters with the individual calyces averaging about 1.5 mm. apart.

The individual calyces are long, tubular and project at right angles from the branches. A typical one measures 1.8 mm. in height and 2 mm. in diameter. The calyx walls are filled with long thorny spindles arranged en chevron, especially on the upper parts where they rise into eight angular points around the margin. The polyps are retractile, but usually rest (in the type) with their collarets just above the calyx margins. The collaret is very strong, consisting of several closely set rows of transverse spindles arranged en chevron over the tentacle bases, where they project in definite points. Beyond this the tentacles have their dorsal surfaces armed with longitudinally placed spindles.

A cross section of the stem shows a rather thin cœnenchyma filled with slender longitudinal spindles, a not very well defined series of water-vascular canals around the axis and an axis composed of a felted mass of slender thorny spindles and penetrated by conspicuous water-vascular canals.

Spicules. These are all slender spindles differing mainly in the number of thorn-like points scattered over their surfaces. Some are almost smooth while others have the points thickly implanted over their surfaces. The spicules of the axis do not differ materially from those of the calyces and general cœnenchyma.

Color. The colony is very light yellowish brown, the polyps not differing in color from the stem and branches.

This specimen came from a greater depth than is often recorded for members of this family.

Genus **Paragorgia** Milne Edwards and Haime.

Paragorgia Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 190.
Paragorgia Kölliker. Icones Histiologicæ, II, 1865, p. 141.
Paragorgia Kölliker. Beiträge zur Kenntniss der Polypen, 1870, p. 12.
Paragorgia Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 28.
Paragorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXIII.
Paragorgia Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 413.

The original description of this genus by Milne Edwards is as follows:

"Polypieroide arborescent, composed of a thin layer of cortical sclerenchyma in the thickness of which is limited the body cavities of the polyps, and a tubular (fistuleux) very large axis in the form of a spongy tissue very rich in calcareous spicules. Polyps united in groups on the extremities of the branches or upon the lateral tubercles, quite distant and irregularly disposed".

Kölliker (1865) confines himself to a definition of the spicules, and (in 1870) gives a sort of key to the genera of his "Briaracea" of which he makes a section "Paragorgiaceæ" characterized by a branched colony in which the branches show a distinct cortical and nuclear part (axis). The genus *Paragorgia* is characterized by the presence of large water-vascular canals in the axis, entirely retractile polyps and wart-like calyces irregularly distributed.

Studer (1887) gives a definition which can be adopted for our present purpose and is translated as follows:

"Colony upright, branched, branches cylindrical, with irregularly disposed warty calyces within which the polyps are retractile. The slightly differentiated axis contains large water-vascular canals. Besides the polyps there are, in *P. nodosa* Kor. and Dan., siphonozooids without tentacles".

The type species of this genus is *Paragorgia arborea*. Other species are *Paragorgia nodosa* Koren and Danielsen, *P. splendens* Thomson and Henderson and the new species secured by the Siboga Expedition.

1. *Paragorgia splendens* Thomson and Henderson. (Plate III, figs. 4, 4*a*).

Paragorgia splendens Thomson and Henderson. Alcyonarians of the Indian Ocean, Part I, 1906, p. 20.

Stat. 95. 5°43'.5 N., 119°40' E. 522 meters. Stony bottom.

Two fragmentary specimens secured. The largest measures 2.3 cm. in height and has a spread equal to the height. The main stem, or branch in 3 mm. in diameter and bifurcates

4.5 mm. from its proximal end. One of the resultant branches gives off a single branchlet, and the other two, besides several nodules with groups of calyces as is characteristic of the genus. These nodules, as well as the single calyces, are all on three sides of the stem and branches, and are more closely crowded that in other species of the genus. The diameter of a terminal branch is 1.3 mm., while its swollen end is 5 mm.

The individual calyces are well marked, proportionally more prominent than in allied species and very unequally distributed. A typical calyx measures 1.3 mm. in height and 2 mm. in diameter. The margin is closed over the retracted polyp and bears eight rather feebly marked lobes. The calyx walls as well as the general cœnenchyma are covered with a superficial layer of small oval spicules. The polyps are completely retractile. There is a narrow but distinct band of red spindles on the dorsal surface of each tentacle, the bands becoming narrower and disappearing distally.

Zooids do not appear to be present in this species.

A section across a branch shows a poorly differentiated axis composed of rather slender tuberculate spindles and penetrated by water-vascular canals. There is a rather regular series of these canals surrounding the axis. The cœnenchyma is filled with stouter spindles intergrading with the oval densely tuberculate forms which constitute the superficial layer. There are also a few small crosses, stars, etc.

Spicules. These have already been described and consist almost exclusively of tuberculate spindles and densely tuberculate oval forms, with all degree of intergradation between them.

Color. The colony is a bright coral red throughout.

Genus **Iciligorgia** Duchassaing de Fontbressin.

Iciligorgia Duchassaing de Fontbressin. Revue des Zoophytes et des Spongiaires des Antilles, 1870, p. 12.
Iciligorgia Ridley. Zoological Collections of H. M. S. Alert, 1884, p. 351.
Iciligorgia Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 29.
Iciligorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXIV.
Iciligorgia Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 413.

The original definition for this genus is as follows:

"Axis mollis, spongiosus, spiculis farctus: cortex tenuis, spiculis aciniformibus formatus; calycibus mammæformibus, obtusis, in utroque latere ramorum uniseriatis".

Ridley (1884) defines the genus as follows:

"Central spicular axis dense, imperforate. Longitudinal canals forming a circumaxial zone. Erect, branched: stem and branches antero-laterally compressed, with knife-like lateral edges. Zooids wholly retractile, arranged in single series along each edge of the branches; no external verrucæ".

Studer (1887) defines the genus as seen in the following translation:

"Here the colony is in the form of an upright branched stem. Stem and branches compressed. Polyps borne in irregular rows on the thin borders of the branches, entirely retractile".

Wright and Studer (1889) give a somewhat more detailed description of the genus as follows:

"The colony is upright and branched; the stem and branches are compressed, irregular in section; the completely retractile polyps occur in a row within a groove along the sharp edge of the branches. The medullary mass forms an axis of spicules. It is close, but brittle in texture, not penetrated by, but surrounded by, longitudinal canals".

The only modification of this definition that the present writer would suggest is the omission of the last phrase. While it is true that the axis in many of the smaller branches is notpenetrated by the canals, it is also true that the large stem of the Siboga specimen about to be described is penetrated by perfectly evident, indeed conspicuous, water-vascular canals.

The type species of this genus is *Iciligorgia schrammi* Duchassaing. The only other known species is *Iciligorgia orientalis* Ridley.

1. *Iciligorgia orientalis* Ridley. (Plate IV, figs. 1, 1*a*).

Iciligorgia orientalis Ridley. Zoological Collections of H. M. S. "Alert", 1884, p. 351.

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells.
Stat. 315. Anchorage east of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion.

Colony incomplete, flabellate, profusely branched, 31 cm. in height and about 25 cm. in spread. Base missing. The main stem is irregular in section proximally, flattened higher up where it has a section of 8 × 12 mm. It gives off a branch 4.8 cm. from its proximal end. Almost immediately above this it forks into two main portions each of which again forks. Beyond this the branching is irregular, but there is a distinct tendency toward a unilateral arrangement of the ultimate twigs, and branchings of the 4th and 5th orders are attained. The ultimate twigs are long and slender, sometimes being as much as 17 cm. long. All of the branches and branchlets are more or less flattened, one of the main branches having a cross section of 11 × 7 cm. and an ultimate twig a section or 3.5 mm. × 2 mm.

The branches have a lateral sharply compressed edge or border, very strongly marked proximally and becoming practically obliterated on the distal parts. In the narrow edges of these ridges or borders there is a sharply impressed groove, like a knife cut, running along the sharp edges of all of the branches and twigs, although it is often practically obliterated by the closing of the adjacent cœnenchyma over the groove. In this groove the polyps are set in a single row on each side of the branches.

There are no calyces, except a few irregularly and sparsely scattered over isolated localities on what appears to be the back of the colony. These are low rounded verrucæ, sometimes round, sometimes oval, and showing indications of eight lobes around the margins. They can hardly be considered as normal. The polyps are completely retractile. There are a few curved spindles on the basal parts of the tentacles which show a tendency toward an en chevron arrangement.

A cross section of the stem shows a thin cœnenchyma filled mainly with oval coarsely tuberculate spicules. There is a regular series of water-vascular canals immediately arround the axis and many others which conspicuously penetrate the axis. The axis is composed of a felted mass of slender rod-like or needle-like spicules, or spicules with distinct thorny points, or spindles with conspicuous irregular verrucæ.

A cross section of a twig shows a relatively thick cœnenchyma in which the polyps are embedded. Here the water-vascular canals do not seem to penetrate the axis.

Spicules. The cœnenchyma is filled with oval and coarsely tuberculate spicules the tubercles being so closely packed as to give a distinct resemblance to a morula, there being no appearance of definite whorls. The axis contains spicules of various forms, the rod-like or needle-like spindles with thorny points predominating. There are also true spindles with coarse irregular verrucæ, and oval forms like those in the cœnenchyma. There are all sorts of intergrading forms as well as an occasional cross, club or irregularly branched form.

Color. The colony is creamy white throughout. Other specimens, however, are tan-colored.

Other specimens from Station 273 are much larger than the one described. One of these is quite symmetrical, 41 cm. in height and with all of the terminal branchlets growing from the upper sides of branches. The color of this specimen is more decidedly a brownish yellow than any other of this species in the collection. Still another specimen shows a larger number of verruciform calyces on the flattened side of the colony. In places the lateral grooves in which the calyces are found, form a series of short definite slits, rather than a continuous groove.

It seems evident from a study of these specimens that *Iciligorgia* can not go into the sub-family Spongioderminæ; because the axis is conspicuously traversed by large water-vascular canals, while that sub-family is characterized by an axis which is not penetrated by these canals.

Genus **Titanidium** Agassiz.

Titanidium (Agassiz Manuscript) Verrill. Revision of the Polypi of the Eastern Coast of the United States. Memoirs Boston Society of Nat. Hist. I, 1863, p. 10.
Briareum Kölliker. Icones Histiologicæ, II, 2, 1865, p. 141.
Titanidium Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 29.
Titanidium Kölliker. Beiträge zur Kenntniss der Polypen, 1870, p. 8.
Titanidium Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXIII.

The original definition of this genus is as follows:

"Corallum irregularly dichotomous or simple; cœnenchyma rather thick, suberous, very spiculose, traversed by well-developed longitudinal ducts arranged in a single series around the axis. Cells disposed on all sides of the branches, not prominent. Axis perfectly distinct from the cœnenchyma, compact, but soft, cork-like, composed of closely united calcareous spicula".

Kölliker (1870) gives the following, which is a adopted in the present work:

"Axis moderately well defined, cortex of a single layer of hard sarcosome with minute canals. Polyps as in *Plexaura*, contained in pits in the cortex. Spicules 3—4—6 and 8-rayed with warty ends".

This author also gives the only good figure that I have seen of *Titanidium suberosum* (Ellis and Solander) the type and, up to the present time, the sole species of this genus.

1. *Titanidium friabilis* new species. (Plate III, figs. 1, 1*a*; Plate XI, fig. 6).

Stat. 304. Lamakera, Solor Island. 16 meters. Coral and sand.

Specimen dried and exceedingly brittle, as if made of soft chalk, 31 cm. in height.

Two large stems are coalesced shortly above their bases and are closely adherent for 8.3 cm. These and all of the branches are round in section, the larger stem being 1.5 cm. in diameter. One of these stems is broken off before branching and the other forms the remainder of the specimen. The stem curves strongly, becoming almost horizontal for .5 cm., after which it suddenly breaks up into a dense tuft of branches and branchlets which form a dense clump or cluster of numerous ultimate twigs. The stem also gives off a single straight branch where it separates from the other stem. This branch forks and one of the resultant branchlets subdivides several times and adds to the clump forming the distal end of the colony. Branchings of the 5th order are sometimes attained. The ultimate branchlets are not noticeably turgid at their ends and are usually about 4 mm. in diameter. The polyps are distributed on all sides of the branches much as in *Plexaura*, and the calyces are entirely included.

The individual calyces are indicated externally by their apertures alone. These are oval or slit-like according to the state of contraction of the polyps, and the slits are cut at various angles to the axis of the branch and are more abundant on the terminal than on the proximal parts of the colony. On the twigs they average a little more than 1 mm. apart and in places show a tendency to a linear arrangement. The character of the polyps can not be ascertained from the type, which is a dried specimen.

The axis is not well defined and is more friable than any other of this family that I have seen. The cœnenchyma is rather thin and the water-vascular canals form an irregular circlet around the axis.

Spicules. The spicules of the cœnenchyma are very densely tuberculate and short, sometimes oval, spindles, the tubercles usually entirely concealing the actual surface. While such forms as Kölliker figures[1] for *Titanidium suberosum* can be found, they are not nearly so abundant as these densely and coarsely tuberculate spindles. In the axis there are a few slender forms with thorny verrucæ, approaching the characteristic spicules of the axis of *Solenocaulon*; but these are greatly outnumbered by the coarsely tuberculate spindles described above. Occasionally more slender spindles are seen, which may be younger spicules.

Color. The colony (dried) is creamy white. When immersed in alcohol it assumes a decidedly yellow color.

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[1] Icones Histiologicæ, II, 2, plate XIX, figs. 19, 20 and 22.

DISTRIBUTION OF THE BRIAREIDÆ COLLECTED BY THE SIBOGA EXPEDITION

List of Stations

at which Briareidæ were collected by the Siboga Expedition
and a List of Species collected at each Station.

STATION 47. Bay of Bima, near South Fort. 55 meters. Mud, with patches of fine coral sand. *Solenocaulon grayi.*

STATION 49. 8° 20'.5 S., 119° 4'.5 E. 69 meters. Coral and shells. *Solenocaulon sterroklonium.*

STATION 51. Madura Bay and other localities in the southern part of Molo strait. From 69 to 91 meters. Fine grey sand; coarse sand with shells and stones. *Solenocaulon grayi.*

STATION 80. 2° 25' S., 117° 43' E. From 50 to 40 meters. Fine coral sand. *Solenocaulon sterroklonium.*

STATION 95. 5° 43'.5 N., 119° 40' E. 522 meters. Stony bottom. *Paragorgia splendens.*

STATION 114. 0° 58'.5 N., 122° 55' E. 75 meters. Hard sand, very fine. *Solenocaulon grayi.*

STATION 117. 1° 0'.5 N., 122° 56' E. 80 meters Sand and coral. *Solenocaulon grayi.*

STATION 122. 1° 58'.5 N., 125° 0'.5 E. 1264—1165 meters. Stone. *Suberia macrocalyx.*

STATION 142. Anchorage off Laiwui, coast of Obi Major. 23 meters. Mud. *Solenocaulon querciformis, Suberia excavata.*

STATION 154. 0° 7'.2 N., 130° 25'.5 E. 83 meters. Grey muddy sand, shells and Lithothamnion. *Solenocaulon sterroklonium.*

STATION 162. Between Loslos and Broken Islands, West coast of Salawatti. 18 meters. Coarse and fine sand with clay and shells. *Solenocaulon grayi.*

STATION 164. 1° 42'.5 S., 130° 47'.5 E. 32 meters. Sand, small stones and shells. *Semperina brunnea, S. jedanensis.*

STATION 240. Banda Anchorage. 9 to 45 meters. Black sand. Coral. Lithothamnion bank in 18—36 meters. *Solenocaulon sterroklonium.*

STATION 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral. *Semperina rubra.*

STATION 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells. *Solenocaulon sterroklonium, S. jedanensis, Semperina brunnea, Iciligorgia orientalis.*

STATION 274. 5° 28'.2 S., 134° 53'.9 E. 57 meters. Sand and shells, stones. *Solenocaulon sterroklonium.*

STATION 282. 8° 25'.2 S., 127° 18 .4 E. Sand, coral and Lithothamnion. *Solenocaulon sterroklonium.*

STATION 284. 8° 43'.1 S., 127° 16'.7 E. 828 meters. Grey mud. *Solenocaulon querciformis.*

STATION 285. 8° 39'.1 S., 127° 4'.4 E. 34 meters. On the limit between mud and coral. *Solenocaulon sterroklonium.*

STATION 297. 10° 39' S., 123° 40' E. 520 meters. Soft grey mud with brown upper layer. *Suberia köllikeri.*

STATION 304. Lamakera, Solor Island. 16 meters. Coral and sand. *Titanidium friabilis.*

STATION 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion. *Iciligorgia orientalis.*

STATION 318. 6° 36'.5 S., 114° 55'.5 E. 88 meters. Fine yellow grey mud. *Solenocaulon sterroklonium.*

STATION 319. 6° 16'.5 S., 114° 37' E. 82 meters. Fine yellowish grey mud. *Solenocaulon sterroklonium.*

STATION 320. 6° 5' S., 114° 7' E. 82 meters. Fine grey mud. *Solenocaulon sterroklonium.*

This table shows that Briaridæ were secured at 25 of the Stations explored by the Siboga Expedition. Of the twelve species secured, seven were new. By far the most common species was *Solenocaulon sterroklonium* which was found at eleven Stations, ranging in depth from about 13 meters to 369 meters. The greatest depth at which a member of this family was secured was 1165 to 1264 meters where *Suberia macrocalyx* was dredged. Other comparatively deep-living species are *Solenocaulon querciformis*, from 828 meters; *Paragorgia splendens*, from 522 meters and *Suberia köllikeri*, from 520 meters.

All of the species are confined, so far as known, to the Indo-Pacific region. The distribution of the five species previously named being as follows:

Solenocaulon sterroklonium, Ternate, Indian Ocean.
Solenocaulon grayi, Northwest coast of Australia and Indian Ocean.
Semperina rubra, Bohol, Philippine Islands.
Suberia köllikeri, North of New Zealand.
Iciligorgia orientalis, Indian Ocean.

Family Sclerogorgidæ Kölliker.

Sclerogorgiaceæ (Subfamily) Kölliker. Icones Histiologicæ, II, 2, 1865, p. 142.
Suberogorgidæ Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 29.
Sclerogorgiadæ Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXIV.
Sclerogorgidæ Bourne. A treatise on Zoology, Part II, Chapter VI, 1900, p. 25.
Sclerogorgidæ Nutting. Hawaiian Alcyonaria, 1908, p. 569.

The original definition of this family is a follows:

"Gorgoniden mit ungegliederter Axe, die aus Hornsubstanz und verschmolzenen Kalkkörpern besteht. Cœnenchyma wie bei *Gorgonia*".

Studer (1887) amplifies this definition as the following translation shows:

"A plainly separable axis and horny substance which surrounds the thickly aggregated spicules. The axis is surrounded by water-vascular canals which communicate with the branched network of cœnenchymal canals which connect the polyps. The polyps show a warty exserted calyx into which the upper, tentacle-bearing part (of the polyp) can retract".

Wright and Studer (1889) give practically the same definition as the above.

The present writer would modify this definition so as to further emphasize the peculiar characters of the axis, as follows:

Scleraxonia with a well defined axis formed by an agglutinated mass of calcareous spicules which have surfaces devoid of verrucæ or of thorny points and are embodied in horny sheaths which often form a mesh or network by cross connection and adhesions.

This is a very well-defined family with only about a dozen known species. It is represented in the Siboga collection by two genera and eight species, three of which are new.

Synoptic view of the genera and species of Sclerogorgidæ collected by the Siboga Expedition.

New species are indicated by an asterisk (*).

Suberogorgia.	**Koroeides.**
S. verriculata (Esper), *S. ornata* Thomson and Simpson, *S. köllikeri* Studer, *S. rubra* Thomson and Henderson, *S.* **appressa*, *S.* **thomsoni*, *S.* **pulchra*.	*K. koreni* Wright and Studer.

Systematic description of genera and species.

Genus **Suberogorgia** Gray.

Suberogorgia Gray. Proceedings Zoological Society of London, 1857, p. 159.
Sclerogorgia Kölliker. Icones Histiologicæ, II, 2, 1865, p. 42.
Suberogorgia Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 30.
Suberogorgia Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXV.
Suberogorgia Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 413.

The original definition is not at present accessible to the writer, the above citation being from Wright and Studer (1889).

Kölliker (1865) defines his genus *Sclerogorgia* as follows:

"Kalkkörper des Cœnenchymes zahlreiche warzige gelbe oder farblose Spindeln 0,10—0,16 mm. lang, daneben auch einfachere Formen, die bei *Scl. verriculata* auch als Doppelrädchen mit zackigen Rändern erscheinen. Kalkkörper der Polypen kleine warzige Spindeln in gewöhnlicher Anordnung".

Studer (1887) claims that the name *Suberogorgia* has the priority for this genus, and defines it as shown in the following translation:

"Upright, branched, sometimes reticulate colonies with slightly exserted calyces which are situated mainly on the two sides of the slightly flattened stem and branches. The cœnenchyma is thick and shows longitudinal furrows on the bare surfaces. The spicules are warty spindles and double wheels".

Wright and Studer (1889) give practically the same definition, which will also serve the purpose of the present work.

The type of this genus is *Suberogorgia suberosa* (Esper). Other species are *S. köllikeri* Studer, *S. ornata* Thomson and Simpson, *S. patula* (Ellis and Solander), *S. rubra* Thomson and Hend., *S. suberosa* (Pallas), *S. verriculata* (Esper) and the new species in the Siboga collection.

1. *Suberogorgia verriculata* (Esper).

? *Gorgonia reticulata* E. and S. (Name only) Nat. Hist. of Zoophytes, 1786, p. 198.
Gorgonia verriculata Esper. Die Pflanzenthiere, II, 1794, p. 124.
Gorgonia verriculata Lamarck. Hist. Nat. Anim. sans Vert., 2me éd., 2, 1836, p. 489.
Gorgonella verriculata Valenciennes. Comptes rendus, XLI, 1855.
Rhipidigorgia verriculata Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 176.
Sclerogorgia verriculata Kölliker. Icones Histiologicæ, II, 2, 1865, p. 142.
Rhipidella verticillata Gray. Annals and Magazine of Natural History, Ser. 4, Vol. V, 1870, p. 407.
Suberogorgia verriculata Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 167.
Suberogorgia verriculata Thomson and Henderson. Alcyonaria of the Indian Ocean, II, 1909, p. 164.

Stat. 299. 10° 52'.4 S., 123° 1.1 E. 34 meters. Mud, coral and Lithothamnion.
Stat. 307. Ipih Bay, South coast of Flores. 27 meters. Volcanic sand.

Colony strictly flabellate and reticulate, base lacking. The height of the specimen is 26.5 cm. and the spread is about 19 cm. The main stem keeps its identity throughout, has a rudely geniculate course, is round in section and has a diameter near base of 7.5 cm. From this main stem arise a few larger branches roughly alternating, and many smaller twigs. These anastomose very extensively, forming a close network the meshes of which vary greatly in size. The smaller twigs, forming the mesh, are round in section and have a rather uniform diameter of about 1.5 mm. The network extends clear to the periphery of the colony and the tips of the free twigs are not appreciably enlarged at the ends. The calyces are small and are distributed on all sides of the branches, but appear to be absent from the main stem and proximal parts of the larger branches. They are quite evenly distributed, averaging about 1 mm. from mouth to mouth.

The individual calyces are very low dome-shaped verrucæ, a typical one measuring about .7 mm. in diameter and showing eight distinct marginal lobes. The calyx walls are filled with minute round or oval spicules. When the polyp is entirely retracted the calyx is completely included. The polyps are minute, disk-shaped when retracted, and have their infolded tentacles armed with a dorsal series of longitudinally disposed spindles.

A cross section of a branch shows a moderate cœnenchyma and an axis composed of agglutinated spindles with smooth surfaces and a horny investment which coalesces freely with others. The axis is not penetrated by water-vascular canals, these being confined to a circlet in the cœnenchyma.

Spicules. As in other species of this genus these are of two sharply distinguished forms. 1st the long, often bent spindles with smooth surfaces and horny investment which coalesces to form the axis; and, 2nd, spindles varying from nearly round or oval forms to the typical terete spindle, and having their surfaces ornamented by regular verrucæ in well defined whorls. A few double wheels are also seen.

Color. The entire colony is a dull grayish brown.

General distribution. The type locality is not known; but was given, apparently at a guess, by Esper as the West Indies, which is extremely improbable. It is reported from the Northwest coast of Australia by Studer, and the Challenger secured it from the Hyalonema grounds, off Japan, 345 fathoms. A very large specimen from Station 307 measures 77.5 cm. in height and 52 cm. in diameter. The color of this specimen, which is dried, is earthy brown.

2. *Suberogorgia ornata* Thomson and Simpson.

Suberogorgia ornata Thomson and Simpson. Alcyonarians of the Indian Ocean. II, 1909, p. 164.

Stat. 81. Pulu Sebangkatan, Borneo Bank. 34 meters. Coral bottom and Lithothamnion.
Stat. 220. Anchorage off Pasir Pandjang, west coast of Binongka. 278 meters. Coral sand.
Stat. 257. Duroa Strait, Kei Islands. Up to 52 meters. Coral.

Colony flabellate and reticulate, 11 cm. in height and about 6.5 cm. in diameter. The stem and branches are not appreciably flattened and are without evident median grooves. The main stem grows from an encrusting base and is 2 mm. in diameter and 7.5 mm. long to the first branch. This branch extends outward and then upward, bears a number of lateral branches, one of which is compound, and is connected with the rest of the colony through several anastomoses. Almost immediately above the first branch the main stem is rather abruptly bent to one side and gives off numerous lateral branches which are irregularly spaced and often compound and anastomose through their branchlets with other branches, forming a loose and irregular network of very delicate texture. Many of the branchlets are not more than .5 mm. in diameter, while the larger branches are scarcely 1 mm. thick. The calyces are irregularly but rather thickly distributed on all sides of the terminal twigs, and on three sides of the others. They average a little more than 1 mm. apart from summit to summit.

The individual calyces are small but prominent for the genus, being in the shape of a dome averaging about .8 mm. in height and 1.5 mm. in diameter at base. The margin is surrounded by eight lobes and the walls are provided with eight rather indefinite longitudinal ribs which are also seen in the general cœnenchyma as rude longitudinal corrugations resembling the bark of a tree. There is a superficial layer of small oval spicules and minute double heads in the calyx walls, beneath which are larger regular spindles. The polyps are completely retracted and much flattened or disk-shaped in retraction. They are provided with a rather weak collaret with the spindles arranged en chevron on tentacle bases. There are rather narrow longitudinal bands of spindles on the dorsal surfaces of the tentacles.

The axis is the typical one as described for the genus.

Spicules. These differ materially from other forms in this genus. There is a superficial incomplete layer of quite small double heads or dumb-bell-shaped forms under which is a much thicker layer of comparatively large spindles, often curved, with thick-set verrucæ arranged in regular whorls.

Color. The colony is a very light grayish brown.

General distribution. Type locality. Andaman Islands, Indian Ocean; also from the Laccadives. Although much more delicate that the type described by Thomson and Henderson, this form agrees well with that species. The describers speak of spicules which they call "double clubs", but their measurements show that they are double heads, as the term is used in the present work. "Stellate forms" would appear when double heads were viewed end on.

3. *Suberogorgia köllikeri* Wright and Studer.

Suberogorgia köllikeri Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 167.
Suberogorgia köllikeri (var. *ceylonensis*) Thomson. Ceylon Pearl Oyster Report. Appendix to Alcyonaria, 1905, p. 171.
Suberogorgia köllikeri (var. *ceylonensis*) Thomson and Simpson. The Alcyonaria of the Indian Ocean, II, 1909, p. 164.

Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 meters. Sand, small stones and shells.
Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells.
Stat. 274. 5°28'.2 S., 134°53'.9 E. 57 meters. Sand and shells. Stones.
Stat. 305. Mid Channel in Solor Straits, off Kampong Menanga. 113 meters. Stony.
Stat. 310. 8°30' S., 119°7'.5 E. 73 meters. Sand with few pieces of dead coral.

Colony roughly flabellate in form, not reticulate, 14.5 cm. in height. The base is attached to a small dead coral. The main stem gives off a stub of a branch 1.6 cm. from its proximal end, and a large compound outward and downward projecting branch 1.7 cm. above the stub. The stem is somewhat flattened, with a cross section of 3.5 mm. × 1.8 mm. The large branch bears unsymmetrically disposed branchlets, all from its upper side. Two of these branchlets are close together, nearly parallel, each with a single terminal twig and both considerably flattened. One of them has a cross section of 3.2 mm. × 1.8 mm. The part of the stem above the main branch already described bears two compound and four simple branches on its outer side. The stem and branches bear median grooves on front and back, and the twigs are flattened usually nearly to their tips. The calyces are mainly lateral in position, but there are a few on the front and back of the colony.

The individual calyces are prominent for this genus, dome-shaped, a typical one measuring 1.5 mm. in height and 2 mm. in diameter at the base. The walls are covered with short oval spicules and there is but a faint indication of marginal lobes. The polyps are completely retractile and show a feeble collaret and a few delicate longitudinally disposed spindles on the dorsal surface of the infolded tentacles.

A cross section of a branch reveals the structure common to the genus, except that the water-vascular canals may be more conspicuous than in other species in the Siboga collection.

Spicules. The cœnenchyma contains numerous spindles varying from almost round to terete in form. The tubercles are very large and closely crowded, but still are in regular whorls. In some cases girdled spindles are seen. The spicules of the axis are irregular, distorted forms with a heavy envelope and agglutinated into a sort of mesh. They bear no points or verrucæ.

Color. The colony is orange red, or red brown in color.

General distribution. Type locality. Hyalonema Grounds, off Japan, 345 fathoms. It has also been reported (as variety *ceylonensis*) from the Ceylon Seas and from the Andamans in the Indian Ocean.

4. *Suberogorgia rubra* Thomson and Henderson.

Suberogorgia rubra Thomson and Henderson. Ceylon Pearl Oyster Report. Appendix to the Alcyonaria, 1905, p. 172.

Stat. 133. Anchorage off Lirung, Salibabu Island. Up to 36 meters. Mud and hard sand.
Stat. 260. 5° 36'.5 S., 132° 55'.2 E. 90 meters. Sand, coral and shells.
Stat. 301. 10° 38' S., 123° 25'.2 E. 22 meters. Mud, coral and Lithothamnion.

Colony flabellate, so profusely and finely branched as to give a false appearance of reticulation although anastomoses are few. Specimen 30.5 cm. high and with a spread of about 21 cm. The stem and branches are round in section and show but slight indications of the median grooves so common in this genus. The main stem is 4.5 mm. in diameter and tortuous in its course. 2.2 cm. from its base it sends off a large branch which is tortuous and gives off a number of lateral branchlets, 5 of which are compound. 3.7 cm. above this branch the main stem divides into two subequal parts, each of which bears numerous lateral branchlets some of which subdivide until brachings of the 6th order are reached. There is a tendency toward a lateral arrangement of branchlets.

The terminal twigs are curved, slender, round in section and average about 1.5 mm. in diameter and about 9 mm. apart. The calyces are sparsely distributed on the main stem and branches and rather regularly distributed on all sides of the branchlets and twigs, although there is a strong tendency to a lateral arrangement on distal twigs.

The individual calyces are conical or dome-shaped, a typical one measuring 1 mm. in height and 1.3 mm. in diameter. The walls are filled with oval, densely tuberculate spicules and the margin bears eight rather definitely marked lobes. The polyps are completely retractile and the tentacles are heavily armed with spindles which are arranged en chevron on the basal parts and in broad longitudinal bands on distal parts.

Spicules. The superficial spicules of the cœnenchyma are oval, very densely tuberculate forms, the real surfaces being concealed by the crowding of the tubercles. Under these are typical terete spindles with crowded verrucæ, usually not in very definite whorls. True girdled spindles seem to be wanting. The spicules of the axis are of the form typical of this genus.

Color. The colony is deep red or crimson throughout, and the polyps are yellow.

General distribution. Type locality. Ceylon Sea.

This handsome species is quite different in habit from any other of the genus in the collection.

5. *Suberogorgia appressa* new species. (Plate V, figs. 1, 1*a*; Plate XI, fig. 7).

Stat. 71. Makassar and surroundings. Up to 32 meters. Mud, sand with mud, coral.
Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells.

Colony flabellate, not reticulate. The stem and basal parts of main branches laterally compressed, other branches flattened. There are sharply defined grooves or furrows on anterior and posterior faces of all branches. The specimen is 46 cm. high and has a spread of about 50 cm. The main stem forks 4.2 cm. above its base and is very strongly laterally compressed, having a cross section of 2.3 cm. × 1.2 cm. The two main branches are directed outward and then curve upward and their basal parts are very strongly laterally compressed, further out they become round and their distal portions are flattened. They are irregularly enlarged in places, the enlargements being due to symbiotic barnacles. The main branches give off a few short branchlets from their lower sides and a number of branchlets, both simple and compound, from their upper sides; and these give off lateral branchlets until branchings of the 6th order are attained. The distance between branches, as well as their arrangement, is very irregular. The calyces are distributed in irregular patches on the surface of the main stem and branches, but are nearly all lateral on the distal parts of the colony.

The individual calyces are quite low verrucæ on proximal parts (although more prominent on the enlargements due to barnacles), but are entirely included on the distal parts, where they fade so insensibly into the general cœnenchyma that their size can not be determined. Their openings are surrounded by eight lobes which are separated by sharp, slit-like radiating incisions, quite different from other species that I have seen. The polyps are completely retracted, and, when retracted, are disk-shaped. The entire dorsal surface of the infolded tentacles is covered with a complete armor of flattened longitudinal spindles or bar-like forms, there being numerous longitudinal series on each tentacle.

A cross section of a branch shows a relatively thin cœnenchyma filled with oval, closely tuberculated spicules. The water-vascular canals are inconspicuous and not so regular as in many species. They do not penetrate the axis. The axis is quite hard and well differentiated, composed of an agglutinated mass of spicules with horny sheaths and smooth surfaces and connected by various bridges and adhesions into a sort of mesh or network.

Spicules. These are almost entirely of two kinds; 1st regular, very short, usually oval spindles with close-set whorls of tubercles, there usually being four such whorls besides the distal caps; 2nd the irregular smooth spicules of the axis described above. Besides these there are the long flattened scale-like spindles of the tentacles.

Color. The colony is dark red, and the polyps white.

A very large specimen from Station 71 appears to belong to this species. It is 107 cm. in height and very profusely branched, the branching often being dichotomous and sometimes unilateral. The species agrees well in detail with the type, from Station 273, although the spiculation of the polyps can not be very well determined, the specimen being dried. The colony is covered with a white substance as if it had been overgrown with mould, but when fragments are placed in water they show an orange red color.

6. *Suberogorgia thomsoni* new species. (Plate VI, figs. 2, 2*a*; Plate XI, fig. 8).

Stat. 154. 0° 7'.2 N., 130° 25'.5 E. 83 meters. Gray muddy sand, shells and Lithothamnion. (Type).
Stat. 204. 4° 20' S., 122° 58' E. 75—94 meters. Sand with dead shells.

Colony flabellate, not reticulate, 8.5 cm. high and with a spread of about 5.5 cm. The stem and branches are round in section, although the latter appear flattened on account of the lateral arrangement of the polyps. Stem 1.9 mm. in diameter and 1.8 cm. long to first branch. The first branch is large, forming about half of the colony, and bears four lateral branches, three of which are compound. The remainder of the main stem bears seven lateral branchlets, two of which are compound. The branches tend to an alternate arrangement with very unequal spaces between them. The ultimate twigs are about 1 mm. in diameter. There are slight indications of median grooves on the main stem and larger branches, but they are quite indistinct and finally lost on distal parts of the colony. The calyces are regularly lateral and alternate in position.

The individual calyces are subconical in shape, a typical one measuring 1.2 mm. in height and 1.9 mm. in diameter at the base. The calyx walls are filled with comparatively heavy spindles, most of which are placed vertically. These differ materially from the oval forms which are found in the calyx walls of other species of this genus.

The polyps are completely retractile. The collaret is delicate, consisting of but one or two rows of slender encircling spindles, above which other spindles are arranged en chevron over the tentacle bases. The rest of the dorsal surfaces of the tentacles bear a number of slender longitudinally disposed spindles.

A cross section of a branch shows practically the same structure described in connection with other species of this genus.

Spicules. The spicules of the cœnenchyma are much more typical spindles, especially in length, than those of other species described. The oval spicules so characteristic of other species are here almost completely lacking, and the spindles are proportionally much more slender. They are covered with conspicuous verrucæ which are not ordinarily in regularly disposed whorls. The spicules of the axis are smooth and are joined by cross connections into a sort of mesh.

Color. The colony is a light reddish brown in color.

A number of fragments from Station 204 apparently belong to this species. Some are more delicate than the type, but there are no other important differences.

7. *Suberogorgia pulchra* new species. (Plate VI, figs. 1, 1*a*; Plate XI, fig. 9).

Stat. 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion.

Several fragments, perhaps of the same specimen, were secured. The largest was flabellate, but straggling in habit, 23.5 cm. in height. The main stem and branches are somewhat flattened, the former having a cross section of 6 mm. × 4 mm. 1.3 cm. above its proximal end it gives off a simple undivided branchlet 14.8 cm. long, and 1.3 cm. higher it bifurcates. Each of the resultant branchlets gives off a single branchlet on one side and several usually simple ones, on the other. The ultimate branches are slender, slightly flattened and about 3 mm. in greater diameter. All of the stem and branches are traversed by distinct median grooves on one side, and most of them on two opposite sides. The calyces are all lateral in position, in two or three interrupted rows on each side of the branch.

The individual calyces are almost completely included, leaving little indication of their presence except in the very fine 8-rayed slits surrounding the calyx mouth. These slits are like sharp cuts radiating from the centre. The polyps are completely retractile, very small, and the dorsal surfaces of the retracted tentacles show a heavy armature of longitudinally placed red spindles showing conspicuously against the yellow substance of the tentacles.

A cross section of the stem shows the characteristic features of this genus.

Spicules. These are of much the same character as in *Suberogorgia appressa.* The cœnenchyma is packed with oval or disk-shaped forms which have their surfaces thickly crowded with coarse verrucae, which, however, are not arranged in regular whorls, but are emplanted irregularly but closely over the entire surface. The spicules of the axis form an agglutinated mass of tortuous bodies which unite in a sort of network or mesh.

Color. The entire colony is a yellowish red or terracotta, with the mouths of the calyces showing yellowish. The opercular spindles are crimson.

Genus **Koroeides** Studer.

Korœides Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 30.
Korœides Wright and Studer. Challenger Reports, the Alcyonaria, 1889, pp. xxxv, 168.
Korœides Nutting. Hawaiian Alcyonaria, 1908, p. 569.

The original definition, which has not been materially altered by subsequent writers so far as I have seen, it as follows: (Taken from WRIGHT and STUDER, 1889).

"The upright colony branches in one plane; the polyps form wart-like verrucæ, which are given off mainly from the sides of the somewhat flattened branches, leaving an interspace free. The spicules of the cœnenchyma are large broad spindles and polygonal, often triangular discs. These latter are closely approximated to one another, and form a pavement-like outer layer in the cœnenchyma. The calyces are thickly covered with polygonial scales, and the tentacles also contain broad smooth spicules. The whole habit, and even the character of the spicules, recall the genus *Acis*.

The axis is colorless and consists of closely intercalated calcareous spindles inclosed in a horny fibrous substance, which remains and preserves the form of the axis after decalcification".

The type of the genus *Korœides* is *K. koreni* W. and S. Two other species have been described, *K. gracilis* Whitelegge and *K. pallida* Hiles, both of which THOMSON and STIMPSON[1] regard as synonyms of *K. koreni*.

1. *Korœides koreni* Wright and Studer. (Plate VI, figs. 3, 3*a*).

Korœides koreni Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 169.
Korœides koreni Thomson and Simpson. Alcyonarians of the Indian Ocean, II, 1909, p. 167.

Stat. 117. 1°0'.5 N. 122°56' E., 80 meters. Sand and coral.

Colony incomplete, very fragile, strictly flabellate, with flattened branches, 7.5 cm. high and with a spread of 14.5 cm. The main stem is round proximally, 3 mm. in diameter and 8 mm. high to first branch. At that point it sends off two opposite long tortuous branches which are round proximally and flattened distally. Their proximal branchlets are broken off, with one exception; but they fork distally into compound branchlets which are slightly flattened. The main stem is broken off 3.4 cm. above its base and is distinctly flattened above the first pair of branches, having a section of 3.3 × 2 mm. It gives off two short stubs and one compound branch on one side and one compound branch on the other. The compound branches are flattened, tortuous, and give off rudely alternate branchlets, two of which are compound and anastomose with branches below. The terminal twigs are really round, but appear to be flattened on account of the lateral disposition of the calyces, which are very uneven in distribution.

The individual calyces are quite variable in size and shape. When the polyp is fully retracted the calyx is almost entirely included. The usual form of the calyx, however, is a very short tube consisting of a fence of upright spicules with their points projecting in a series around the margin. A typical calyx measures 1.5 mm. in height and about the same in diameter. In some calyx walls the large vertical spindles tend to an en chevron arrangement, in some they are vertical and in still others they are mainly horizontal. The polyps are completely retractile. The collaret is feeble and the tentacle bases bear rather strong spindles arranged en chevron, and above these each tentacle is armed with strong curved longitudinal spindles.

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[1] Alcyonarians of the Indian Ocean, II, 1909, p. 168.

A cross section of a branch shows a moderately thick cœnenchyma filled with very large, warty horizontal spindles. The axis is more dense and well defined than in other genera of the Sclerogorgidæ. The spicules are definite in form, usually terete, but with a smooth surface like that of an icicle. They are not bound to each other by cross connections, but seem to adhere by their contiguous sides.

Spicules. The cœnenchyma and calyces are filled with very heavy spindles which have their whole surface packed with verrucæ which are not in definite whorls. Some of these spindles measure as much as 2.5 mm. in length and 1.5 mm. in diameter. They are almost exactly like those found in the genus *Muricella* or *Acis*. The spicules of the axis have already been described. They are much smaller than those of the cœnenchyma.

Color. The colony is a brilliant scarlet, but this color is obscured and given a pinkish cast by a whitish growth of sponge which covers it like a film. The axis is light yellow; the polyps are whitish, probably yellow in life, and the spicules are crimson and yellow.

General distribution. Type locality. Hyalonema Ground, off the coast of Japan, 345 fathoms. It has also been reported from the Laccadive Islands.

If THOMSON and SIMPSON are right in combining the forms described as *Korœides gracilis* and *K. pallida* with *K. koreni*, the range of this species is much greater, embracing Funifuti (WHITELEGGE), Ceylon and the Andamans (THOMSON and HENDERSON), New Britain (HILES) and the Hawaiian Islands (NUTTING).

DISTRIBUTION OF THE SCLEROGORGIDÆ COLLECTED BY THE SIBOGA EXPEDITION

List of Stations

at which Sclerogorgidæ were collected by the Siboga Expedition
and a List of Species collected at each Station.

STATION 71. Makassar and surroundings. Up to 32 meters. Mud, sand with mud, coral. *Suberogorgia appressa.*

STATION 81. Pulu Sebangkatan, Borneo Bank. 34 meters. Coral bottom and Lithothamnion. *Suberogorgia ornata.*

STATION 117. 1° 0′.5 N., 122° 56′ E. 80 meters. Sand and coral. *Korœides koreni.*

STATION 133. Anchorage off Lirung, Salibabu Island. Up to 36 meters. Mud and hard sand. *Suberogorgia rubra.*

STATION 154. 0° 7′.2 N., 130° 25′.5 E. 83 meters. Grey muddy sand, shells and Lithothamnion. *Suberogorgia thomsoni.*

STATION 164. 1° 42′.5 S., 130° 47′.5 E. 32 meters. Sand, small stones and shells. *Suberogorgia köllikeri.*

STATION 204. 4° 20′ S., 122° 58′ E. From 75—94 meters. Sand with dead shells. *Suberogorgia thomsoni.*

STATION 220. Anchorage off Pasir Pandjang, West coast of Binongka. 278 meters. Coral sand. *Suberogorgia ornata.*

STATION 257. In Duroa Strait, Kei Islands. Up to 52 meters. Coral. *Suberogorgia verriculata.*

STATION 260. 5° 36′.5 S., 132° 55′.2 E. 90 meters. Sand, coral and shells. *Suberogorgia rubra.*

STATION 273. Anchorage off Pulu Jedan, East coast of Aru Islands. (Pearl Banks). 13 meters. Sand and shells. *Suberogorgia köllikeri, S. appressa.*

STATION 274. 5° 28′.2 S., 134° 53′.9 E. 57 meters. Sand and shell. Stones. *Suberogorgia köllikeri.*

STATION 299. 10° 52′.4 S., 123° 1′.1 E. 34 meters. Mud, coral and Lithothamnion. *Suberogorgia verriculata.*

STATION 301. 10° 38′ S., 123° 25′.2 E. 22 meters. Mud, coral and Lithothamnion. *Suberogorgia rubra.*

STATION 305. Mid Channel in Solor Strait, off Kampong Menanga. 113 meters. Stony. *Suberogorgia köllikeri.*

STATION 307. Ipih Bay, South coast of Flores. 27 meters. Volcanic sand. *Suberogorgia verriculata.*

STATION 310. 8° 30′ S., 119° 7′.5 E. 73 meters. Sand with a few pieces of dead coral. *Suberogorgia köllikeri.*

STATION 315. Anchorage off Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion. *Suberogorgia pulchra.*

The table shows that species of this family were secured at 18 stations, and that one species was secured at each station, with the exception of Station 273 where two species were found. This station must have been exceedingly rich in alcyonarian life, although but two of the Sclerogorgidæ were secured here.

This family seems to be largely confined to shallow water, as but a single species was secured from a depth greater than 100 meters. The species referred to was *Suberogorgia köllikeri*, secured at Station 305 at a depth of 113 meters.

Two of the species in the Siboga collection, however, were secured by the Challenger off Japan at a depth of 345 fathoms. These are *Suberogorgia verriculata* and *S. köllikeri.*

If THOMSON and SIMPSON[1] are correct in regarding *Koroeides gracilis* and *K. pallida* as synonyms of *K. koreni*, this species has a wider range than any other of the family Sclerogorgidæ in the collection, extending from the Indian Ocean to Japan and the Hawaiian Islands.

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[1] Alcyonaria of the Indian Ocean, II, 1909, p. 167.

Family Melitodidæ Wright and Studer.

Melitea (in part) Lamouroux. Histoire des Polypiers coralligènes flexibles, 1816, p. 458.
Isidinæ (in part) Milne Edwards et Haime. Histoire Naturelle des Coralliaires, I, 1857, p. 192.
Melithæaceæ (in part) Kölliker. Icones Histiologicæ, II, 1865, p. 142.
Melithæadæ + *Mopselladæ* + *Trinellidæ* + *Elliselladæ* (in part) Gray. Catalogue of Lithophytes in the British Museum, 1870, p. 24.
Trenellidæ Ridley. Contributions to the knowledge of Alcyonaria, Annals and Magazine of Natural History, Series V, Vol. X, 1882, p. 130.
Melithæidæ Ridley. Zoological Collections H. M. S. Alert, 1884, p. 356.
Melithæidæ Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 30.
Melithæidæ Ridley. Alcyonaria of the Mergui Archipelago, Journal Linnæan Society, 1888, XXI, p. 244.
Melitodidæ Wright and Studer. Challenger Reports, the Alcyonaria, 1889, pp. XXXV, 170.
Melitodidæ Bourne. A treatise on Zoology, II, Chap. VI, 1900, p. 25.
Melitodidæ Kükenthal. Die Gorgonidenfamilie der Melitodidæ Verrill. Zoologischer Anzeiger, Bd. XXXIII, N⁰ 7/8, 1908, p. 189.

On account of their striking superficial resemblance in the jointed axis to certain Isidæ, the species of the Melitodidæ and Isidæ were placed together by a number of the earlier writers, much to the confusion of the systematic arrangement of these forms. LAMOUROUX (1816) recognized the difference between the axes of this heterogeneous group of "Isidées" and formed the genus *Melitea* to accommodate species with spongy and inflated internodes, and included in it *Melitea ochracea*, *M. de risso* (= *Isis coccinea* Gmelin), *M. retifera* and *M. textiformis*.

MILNE EDWARDS and HAIME (1857) combine the genera *Isis*, *Mopsea* and *Melithæa* in their subfamily Isidinæ.

KÖLLIKER (1865) included the genera *Melithæa* and *Mopsea* in his subfamily Melithæaceæ.

RIDLEY (1884) discusses the family "Melithæidæ" at considerable length and shows that the three families Melithæidæ, Mopsellidæ and Ellisellidæ of GRAY can not be regarded as distinct, and includes them all in one family Melithæidæ in which he includes the following genera: *Melitodes*, *Clathraria*, *Wrightella*, *Mopsella*, *Acabaria*, *Trinella* and *Parisis*, and adds a new genus *Psilacabaria*.

STUDER (1887) included in "Melithæidæ" the same genera as are included by RIDLEY, but combines the genera *Parisis* of VERRILL and *Trinella* of GRAY.

WRIGHT and STUDER (1889) substitute the name Melitodidæ for Melithæidæ of RIDLEY because the basis name for the old family was Melitæa, which had previously been used for a genus of insects; while VERRILL (1863) proposed the generic name *Melitodes* as practically a substitute for Melitæa of earlier writers. This suggested the name Melitodidæ as a family designation proposed by WRIGHT and STUDER, who include the same genera that are named by STUDER. Their definition of the family is as follows:

"Scleraxonia with a well-marked axis, which is jointed, i. e., consisting of alternating portions of a hard calcareous and a soft horny substance. The hard joints (internodes) consist of fused calcareous spicules, with but a trace of horny substance: the soft joints (nodes) are formed of loose calcareous spicules in a mesh of horny substance".

KÜKENTHAL (1908) gives a more extended definition, which may be translated as follows:

"Scleraxonia with an evident axis sometimes traversed by endodermal canals and consisting of soft (nodes) and hard (internodes) joints. The hard joints consist of complety fused calcareous spicules, and the soft joints consist of rod-like smooth spicules immersed in a horny material. The branching is dichotomous, usually from the nodes, and the colony is usually flabellate. The polyps are borne in calyces arranged either in the lateral borders or one side of the branches. The polyp spicules are spindles or clubs, the cortex spicules are in part "Blattkeulen".

This definition is acceptable for the purpose of the present work.

This same writer (KÜKENTHAL, 1908) furnishes an excellent key to the genera of the family Melitodidæ. This is so well devised that the following translation is offered, the new genus _Birotulata_ being added:

1. Polyps with exserted calyces.
    A. Branchings from the nodes, only the terminal twigs sometimes from the internodes.
        1. Cortex spicules spindles or thorny clubs.
            _a._ Nodes and internodes traversed by water-vascular canals. Polyps ordinarily placed on one side of the branches . . . **Melitodes** Verrill.
            _b._ Water-vascular canals not in the internodes. Polyps distant and biserially placed . . . . **Acabaria** Gray.
        2. Cortex spicules foliaceous clubs . . . . **Mopsella** Gray.
        3. The foliaceous clubs are nodular in form . . . . **Wrightella** Gray.
        4. Cortex spicules double wheels . . . . **Birotulata** Nutting.
    B. Branchings from the internodes only . . . . **Parisis** Verrill.
2. Polyps with inserted calyces . . . . **(Clathraria)** Gray.

Synoptic view of the genera and species of MELITODIDÆ collected by the Siboga Expedition.

New genus and species are indicated by an asterisk (*).

Melitodes.

M. ochracea, _M. flabellum_, _M. variabilis_, _M. esperi_ _M._ _*squamata_, _M._ _*modesta_.

Acabaria.

A. philippinensis, _A. tenuis_, _A._ _*formosa_, _A._ _*hicksoni_, _A._ _*triangulata_.

Mopseida.

M. clavigeri, _M._ _*studeri_, _M._ _*spongiosa_.

Wrightella.

W. coccinea, _W. tongænsis_.

Parisis.

P. fruticosa, _P. minor_.

***Birotulata.**

_B._ _*minor_.

This table shows that the collection contained six genera, one of which is new and nineteen species, eight of which are new. The genus *Melitodes* has the largest representation, with six species, half of which are new; and *Acabaria* comes nexth with five species, two of which are new.

Systematic description of genera and species.

Genus **Melitodes** Verrill.

Isis (in part) Linnæus. Systema Naturæ, 12th edition, 1767, p. 1287.
Isis (in part) Ellis and Solander. Natural History of Zoophytes, 1786, p. 104.
Isis (in part) Pallas. Elenchus Zoophytorum, 1766, p. 230.
Isis (in part) Esper. Die Pflanzenthiere, 1791, Vol. I, p. 29.
Melitea Lamarck. Memoires Museum nat. hist., I, 1815, p. 410.
Militea Lamouroux. Hist. Polyp. flex., 1816, p. 458.
Melitea Lamarck. Hist. nat. Anim. sans Vert., 2, 1836, p. 470.
Melithæa Milne Edwards et Haime. Hist. Nat. des Coralliaires, I, 1857, p. 199.
Melitodes Verrill. Bull. Museum of Comp. Zool., 1864, p. 38.
Melitella Gray. Proc. Zool. Society of London, 1859, p. 485.
Melithæa (in part) Kölliker. Icones Histiologicæ, II, 2, p. 142.
Melitodes Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 31.
Melitodes (in part) Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 171.
Melitodes Bourne. A treatise on Zoology, Part II, Chap. VI, 1900, p. 25.
Melitodes Delage et Hérouard. Traité de Zoology Concrète, 1901, p. 414.
Melitodes Kükenthal. Die Gorgonidenfamilie der Melitodidæ, 1908, p. 190.

PALLAS (1766) and other of the earlier writers included the species then known of this genus in the genus *Isis*.

LAMARCK (1815) separated the genus Melithæa from *Isis*, as then known, by a definition which may be translated as follows:

"Colony fixed, tree-like, composed of a jointed axis and persistent cortical layer. Central axis rooted, branched, formed of stony joints substriated, with spongy and inflated internodes. The cortical layer contains the polyps when fresh, and small cellules when dried".

LAMARCK (1815) and MILNE EDWARDS and HAIME (1857) give practically the same definition as the above.

VERRILL, (1865) shows that the name Melithæa is preoccupied, and proposes the present name, Melitodidæ, for the family, and STUDER (1887) adopts the name *Melitodes* for the type genus of the family, in which he has been followed by subsequent writers. STUDER's definition for the genus may be translated as follows:

"*Melitodes* has all joints traversed by longitudinal canals. The spicules of the cœnenchyma are large warty spindles on the one hand and kneed ('knotige') spindles on the other".

KÜKENTHAL (1908) gives a satisfactory definition which will be adopted here. A somewhat condensed translation is as follows:

"Colony almost always flabellate, branching, dichotomous, with branches from the nodes. Axis penetrated by water-vascular canals. Cœnenchyma variable in thickness and filled with straight spindles, half-sided, thorny and kneed spindles, thorny clubs and irregular forms, but without foliaceous clubs. Polyps project from one side of the somewhat flattened branches and on their borders, and are retractile within exserted clayces".

The type of this genus is *Melitodes ochracea* (Pallas). The following list of species is taken largely from Kükenthal's paper above referred to: *M. africana* Kükth., *M. albitincta* Ridley, *M. arborea* Kükth., *Melitodes densa* Kükth., *M. flabellum* Thomson, *M. flabellifera* Kükth., *M. fragilis* Wright and Studer, *M. lævis* Wrigt and Studer, *M. nodosa* Wright and Studer, *M. ornata* Thomson and Simpson, *M. pulchella* Thomson and Simpson, *M. rugosa* Wright and Studer, *M. rubeola* Wright and Studer, *M. stormii* Studer, *M. sinuata* Wright and Studer, *M. sulphurea* Studer, *M. variabilis* Hickson and the new species described in this report.

1. *Melitodes ochracea* (Linnæus).

Isis ochracea Linnæus. Systema Naturæ, 10th edition, 1758, p. 799.
Isis ocracea Pallas. Elenchus Zoophytorum, 1766, p. 230.
Isis ochracea Ellis and Solander. Natural History of Zoophytes, 1786, p. 105.
Isis ochracea Esper. Pflanzenthiere, I, 1791, p. 38.
Melitea ochracea Lamouroux. Histoire Polyps flexibles, 1816, p. 462.
Melitæa ochracea Lamarck. Histoire Naturelle des Animaux sans Vertèbres, II, 1836, p. 472.
Melithæa ochræea Kölliker. Icones Histiologicæ, 2, 1865, p. 142.
Melitodes ochracea Wright and Studer, Challenger Reports, the Alcyonaria, 1889, p. 292.
Melitodes ochracea Studer. Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck, 1894, p. 109.

Stat. 71. Makassar and surroundings. Up to 32 meters. Mud. Sand with mud. Coral. (Numerous specimens).
Stat. 85. 0° 36'.5 S., 119° 29'.5 E. 724 meters. Fine grey mud.
Stat. 234. Nalahia Bay, Nusa Laut Island. 46 meters. Stony.

A number of large dried specimens, very much broken up, must be referred to this species. One of these must have been a magnificent spectacle when alive, as the incomplete specimen measures over one meter in height and 5.9 cm. in diameter at base. The main stem and branches are strongly compressed laterally, but the smaller branches are ronnd. The nodes are indicated externally by annular swellings, but they are almost obliterated internally in the larger branches. In a branch 8 mm. in diameter, for instance, the nodes can scarcely be seen, being indicated in a longitudinal section by an indistinct narrow band less than 1 mm. broad, while the adjacent internode is 20 mm. long. The polyps are thickly distributed on three sides of the branches, leaving a broad posterior face bare. The branching is usually dichotomous, but sometimes lateral. The calyces are included, and the characters of the polyps can not be made out in the dried specimens. The axis is penetrated by numerous canals.

Spicules. The spicules are mostly small oval spindles with proportionally large densely crowded verrucæ. The hard internodes are made up of an agglutinated mass of rod-like spicules which adhere together so strongly that they do not boil apart in caustic potash. The cœnenchyma contains a number of warty clubs, and there are also warty spindles, probably from the polyps.

Color. The entire colony is a dark brick red. Axis darker. In other specimens the general surface of the smaller branches is yellow, with scarlet verruciform calyces, the back and sides being bright yellow.

General distribution. The Indian Ocean, which is the type locality.

2. *Melitodes flabellum* Thomson and Mackinnon.

Melitodes flabellum Thomson and Mackinnon. Alcyonaria of the Percy Sladen Trust Expedition, Part II, 1910, p. 198.

Stat. 164. 1° 42'.5 S., 130° 47'.5 E. 32 meters. Sand, small stones and shells.
Stat. 261. Elat, West coast of Great Kei Island. 27 meters. Mud.
Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells.
Stat. 305. Mid Channel in Solor Strait, off Kampong Menanga. 113 meters. Stony.
Stat. 310. 8° 30' S., 119° 7'.5 E. 73 meters. Sand, with few pieces of dead coral.

Colony strictly flabellate and reticulate, 19.5 cm. long and with a spread of 12.5 cm. The main stem is nearly round, the horny joints (internodes) being 5 mm. in diameter and the calcareous nodes 3.5 mm. in diameter. The internodes are about 5 mm. long, and the nodes 3 to 4 mm. The branches are borne on the internodes and are typically alternate and lateral in position. From its basal 6.5 cm. the stem gives off occasional irregular branchlets which do not form a part of the flabellate structure. Above this point the stem soon dissipates itself in a reticulate mass of branches and branchlets, the branching being, in general, dichotomous. In the fan the internodes are usually about 9 mm. in length and 1 mm. in diameter; while the nodes are triangular, as a rule, the triangle being about 2 mm. long and nearly equilateral. Most of the branchlets terminate in U-shaped bifurcations on the margins of the fan. Nearly all of the calyces are lateral in position, forming a close-set row on each side of the branches and twigs. In places the row is quite even, but in others it is decidedly zigzag.

The individual calyces are quite small, rather low, dome-shaped verrucæ, averaging less than .5 mm. in height and slightly over 1 mm. in diameter, the gradually sloping wall of one meeting that of its neighbor so as to give a scalloped appearance to the margins of the branches, when viewed from above. Their apertures are almost completely closed, in the specimen described, and their walls are filled with heavily tuberculated spindles and spiny clubs which form an indistinct circlet of prominences around the margins.

The polyps are minute, but show a well defined collaret composed of one or two rows of bent spindles and a pseudo-operculum of similar spindles arranged en chevron basally and disposed longitudinally on distal parts of tentacles; the whole forming a symmetrical rosette when viewed from above.

Spicules. Those of the axis are small, smooth, bar-like forms aggregated together into a felted mass which is less dense in the horny and more dense in the calcareous nodes. They do not boil apart in caustic potash. The spicules of the cœnenchyma are exceedingly varied in form, but are all modifications of the tuberculate spindle on the one hand and of the spiny club on the other. The spindles are densely tuberculate and usually short and stout, but sometimes slender and curved. The clubs are all of the spiny type, none of the Blattkeulen being present. The spindles immensely preponderate over the clubs in number.

Color. The colony of the specimen described is a light grayish brown and the spicules are colorless. Another specimen from the same station is dull red.

General distribution. Type locality. Providence, Indian Ocean, 6 fathoms.

A specimen from station 305 is a flabellate, matted mass as if several fans lying in parallel planes had been united by horizontal connections, very much resembling the illustration given by Thompson and Simpson (Alcyonarians of the Indian Ocean, 88, 1909, p. 170) of *Melitodes variabilis*. But one internode of the stem remains, and this is 3 mm. broad and nearly 4 mm. long and the accompanying internode is longitudinally furrowed, 2.3 mm. in diameter and 4 mm. long. The stem forks at the node and the resultant branches bear numerous branchlets, or bifurcate repeatedly; some of the branchlets being inclined forward and some backward, each being compressed and flabellate thus forming a colony composed of several palmate structures in parallel planes which are held together by branches passing from one to the other and anastomosing. The resulting network is quite irregular. The main branches are laterally compressed. In details and spiculation, however, this specimen agrees with the one described above.

3. ? *Melitodes variabilis* Hickson.

Melitodes variabilis Hickson. The Alcyonaria of the Maldives, III, Vol. II, 1905, p. 809.
Melitodes variabilis Thomson and Simpson. Alcyonarians of the Indian Ocean, II, 1909, p. 169.
Melitodea variabilis Thomson and Mackinnon. Alcyonaria of the Percy Sladen Trust Expedition, Part II, 1900, p. 198.

Stat. 60. Haingsisi, Samau Island, Timor. 23 meters. Lithothamnion in 3 meters and less. Reef.
Stat. 274. 5°28'.2 S., 134°53'.9 E. 57 meters. Sand and shells. Stones.

The specimens secured by the Siboga Expedition are fragmentary. They show the red nodes and white internodes of this species. The larger specimen from Station 60 consists of the base of attachment and a few stumpy and divergent branches.

In the specimen from station 274 the calyces are yellow.

General distribution. "Throughout the Maldives" (Hickson). Indian Ocean.

4. *Melitodes esperi* Wright and Studer.

Melitodes esperi Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 179.

Stat. 33. Bay of Pidjot, Lombok. 22 meters and less. Mud, coral and coral sand.
Stat. 50. Bay of Badjo, West coast of Flores. Up to 40 meters. Mud, sand and shells.
Stat. 60. Haingsisi, Samau Island, Timor. 23 meters. Lithothamnion.
Stat. 80. 2°25' S., 117°43' E. 50—40 meters. Fine coral sand.
Stat. 144. Anchorage north of Salomakieë (Damar) Island. 45 meters. Coral bottom and Lithothamnion.
Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 meters. Sand, small stones and shells.
Stat. 257. In Duroa Strait, Kei Islands. Up to 52 meters. Coral.

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells.
Stat. 315. Anchorage east of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion.

Colony strictly flabellate and reticulate, the distal part only being present and consisting of four large branches connected by numerous anastomoses. Height 16.5 cm. Spread 10 cm. The main branches are laterally compressed, a cross section of a typical one being 2 × 3.1 cm. The nodes are 6 to 14 mm. long, the longer ones being in the distal parts of the colony, and the internodes are 2 to 5 mm. long, the longer ones being in the basal parts of the colony. The branching is usually dichotomous, and the anastomoses are through short lateral connections. The smaller branchlets also are laterally compressed, a typical one being 1.1 × 1.9 mm. in section. The calyces are thickly distributed over three sides of the branches, leaving the back of the colony bare, as a rule, although there are calyces on this side of some of the twigs.

The calyces are almost entirely included in the specimen described. This is probably due, however, to the state of retraction of the polyps, for in other specimens, where the polyps are expanded, the calyces appear to be tubular with spicules arranged en chevron around the upper parts. The upper parts of the calyces are yellow, in sharp contrast to the rich crimson of the general cœnenchyma. Their walls are filled with short densely tuberculate spindles, sometimes oval or disc-shaped, which appear like imbricating scales, the upper edge of one overlapping the lower edge of another. The margin is surrounded by eight lobes.

The polyps are completely retractile and are furnished with a strong collaret above which are eight points formed usually by two spicules at the base of each tentacle, each pair having its distal ends approximated and its proximal ends divaricated. Above these points the dorsal surface of each tentacle is covered with an incrustation of densely tuberculate yellow spicules which are usually longitudinally disposed.

Spicules. Those found in the cœnenchyma are variously formed tuberculate spindles and spiny clubs. The spindles are often oval or disk-shaped with the tubercles sometimes arranged in definite whorls and sometimes very heavy and without definite arrangement. A few curved spindles are also seen. Some of the clubs are tuberculate and others spiny.

Color. The colony is deep crimson with the polyps and calyx margins bright yellow.

General distribution. Type locality. Torres Strait.

A specimen from Station 144 agrees quite closely in coloration with RIDLEY's figure of *Psilacabaria gracillima*[1].

5. *Melitodes squamata*, new species. (Plate VII, figs. 1, 1*a*, Plate XII, fig. 1).

Stat. 299. 10° 52.4 S., 123° 1'.1 E. 34 meters. Mud, coral and Lithothamnion.

Colony flabellate, but not reticulate, although it appears to be so. 27.5 cm. in height and about 10 cm. in width. The stem and branches are approximately round in section. The first large branch is 2.6 cm. above the base of the stem. The horny nodes are much swollen,

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[1] Zoological Collections H. M. S. Alert, 1884, pl. XXXVI, fig. E'.

8 mm. in diameter and 6 mm. long. The calcareous nodes are 6 mm. in diameter and about 4 mm. long. All of the branches are borne on the horny nodes which vary in length from 5 mm. on proximal branches to 12.5 mm. on distal branchlets. The first are annular and the latter triangular in outline. The calcareous nodes vary from 4.1 mm. to 12.5 in length, the latter being the distal ones. The main branches are lateral and alternate in position, but the distal branchings are regularly dichotomous, the forkings being U-shaped. The ultimate twigs are very slender, being but 1 mm. in diameter. The polyps are distributed on all sides of the smaller branches and branchlets, and on three sides of the more proximal branches and parts of branches. They are usually lateral on the main stem and branches.

The individual calyces are minute, almost entirely included even when the polyps are partly expanded, and about 1 mm. in diameter. They are rendered conspicuous by their color which is a brilliant crimson while the general cœnenchyma is a yellowish red or deep orange. Their walls are filled with crimson spicules which look like small imbricating disks when in situ. The polyps are quite heavily spiculated. There is a strong collaret often of crimson, sometimes of light yellow spicules, above which is a pair of spicules forming a point above each tentacle base by the approximation of their distal ends. These spicules are also often crimson in color. Above these points other strong spindles lie along the distal parts of the dorsal surfaces of the tentacles.

The cœnenchyma of the branches appears to be filled with rounded or disk-like imbricating scales.

Spicules. Those of the cœnenchyma are disk-like tuberculate forms intergrading with ordinary spindles with tubercles arranged in regular whorls. Tuberculate clubs are also seen in moderate numbers, but I find no spiny clubs or Blattkeulen. The spicules of the axis are smooth bars and needle-like forms, resembling fragments of spun glass when viewed through the microscope. Bent tuberculate spindles are found in the polyps.

Color. The colony is orange red, in general coloration, but the distal parts lighten to almost white, as if they had been partly dried or bleached. The calyces are crimson and the polyps yellow or pallid.

6. *Melitodes modesta*, new species. (Plate VII, figs. 2, 2*a*; Plate XII, fig. 2).

Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 meters. Sand, small stones and shells.
Stat. 273. Anchorage off Pulu Jedan, East coast of the Aru Islands. 13 meters. Sand and shells. (Type).
Stat. 274. 5°28'.2 S., 134°53'.9 E. 57 meters. Sand and shells. Stones.

Colony strictly flabellate and moderately reticulate, 13 cm. high and with a spread of 7.5 cm. The main stem grows from an expanded base which seems originally to have supported two such stems. The remaining stem shows that a large branch has been broken off immediately above the base, and above this the stem gives off alternate branches, one from each node. The second free node is about 4 mm. long and the same in diameter, while the internode below it is about 3 mm. in diameter and length; but the nodes and internodes blend so as to make it difficult to ascertain their limits. As in other species of this genus the nodes decrease and the internodes increase in length as we go from proximal to distal parts of the colony where the nodes are but a little more that 1 mm. and the internodes are sometimes 9 mm. long. The branchings are mainly dichotomous and the forkings are U-shaped. Many of the smaller branches are frequently girdled by a small parasitic form which looks like checkered belts or bands tightly compressing the cœnenchyma. The calyces are mainly lateral and anterior in position, and are so low as to be barely visible.

The individual calyces are very low rounded domes, more evident on the distal twigs then elsewhere. They are very small, averaging scarcely more than 1 mm. in diameter. Their walls are filled with spiny spindles and thorny clubs, the edges of which give a serrated appearance. The polyps are very small and so completely retracted that their characters are hard to make out. They have a strong collaret above which are spindles arranged en chevron over the tentacle bases and longitudinally on the dorsal surfaces of the tentacles. In certain stages of retraction these latter spicules form a series of points beyond which the tentacles suddenly bend downward.

Spicules. These are mainly rather large spiny spindles, with the individual spines often spinulate. There are also one-sided spindles, spiny clubs and numerous other forms, all of which are but modifications of the spiny spindle characteristic of this genus.

Color. The colony is lemon yellow and the axis is dark pink.

Other specimens are more robust than the type described, and the calyces are distributed on all sides of the distal branches. These specimens are light orange brown, instead of yellow, in color.

Genus **Acabaria** Gray.

Acabaria + *Anicella* Gray, Annals and Magazine of Natural History, 4th Series, Vol. 2, 1868, p. 444.

Acabaria Ridley. Zoological Collections H. M. S. Alert, 1884, p. 360.

Acabaria Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 31.

Acabaria Wright and Studer. Challenger Report, the Alcyonaria, 1889, p. XXXVI.

Acabaria Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 414.

Acabaria Kükenthal. Die Gorgonidenfamilie der Melitodidæ, Zoolog. Anz. Bd. XXXIII, 1908, p. 194.

The original definition of this family is as follows:

"The coral very slender, branched dichotomous, expanded in a plane; branches and branchlets very slender, compressed, with short swollen joints, more pronounced on the older stems. Bark thin, hard, smooth. Cells short, broad, subcylindrical, truncated, in a single series on each edge of the branches and branchlets, rather close together. Axis calcareous, solid, red, longitudinally grooved; internodes short, swollen spongy".

The same author proposes the genus *Anicella*, based on an Australian species with internodes (nodes, as the term is now used) red, swollen. This can hardly be regarded as a generic character, and the species should be included in *Acabaria*.

Ridley (1884) practically adopts the above definition, but establishes a new genus *Psilacabaria*, which Kükenthal (1908) would include in *Acabaria*.

STUDER (1889) gives a very brief characterization of this genus.

"*Acabaria* Gr. Wie *Mopsella*, aber die Spicula der Rinde sind nur Spindeln".

KÜKENTHAL (1908) gives a satisfactory definition, as indicated in the following translation:

"Branching flabellate, dichotomous, branches originating at the nodes. Branches very slender, slightly or not at all flattened. Internodes not pierced by water-vascular canals. Polyps retractile within large calyces, biserially arranged and usually widely spaced. Spicules never foliaceous clubs".

The type species of this genus is *Acabaria divaricata* Gray. Other described species are *Acabaria australis* Gray, *A. biserialis* Kukth., *A. corymbosa* Kükth., *A. erythracea* (Ehrenb.), *A. frondosa* (Brundin), *A. gracillima* (Ridley), *A. habereri* Kükth., *A. japonica* Verrill, *A. philippinensis* (Wright and Studer), *A. serrata* Ridley, *A. tenuis* Kükth., *A. undulata* Kükth., *A. valdiviæ* Kükth., and the new species described in the present work.

1. *Acabaria philippinensis* (Wright and Studer).

Melitodes philippinensis Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 176.
Melitodes philippinensis Thomson and Simpson. Alcyonarians of the Indian Ocean, II, 1909, p. 172.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 meters. Sand, with a few pieces of dead coral.

Specimens flabellate, the largest being a fragment 6.2 cm. long and about 4 cm. in spread. Stem and branches round. Main stem 2.1 mm. in diameter and 1.5 cm. long to first branch. The first complete node is 4 mm. long and 3 mm. in diameter, and a distal one is 1.2 mm. long. The proximal internode is 1 cm. long and 2 mm. in diameter, while a distal internode is 1.4 cm. long and 8 mm. in diameter. The branching is irregularly dichotomous and the furcations are Y-shaped rather than U-shaped. The calyces are mostly lateral leaving a broad bare space on the back of the colony and a narrow one, sometimes invaded by calyces, on the front. There is often a tendency to form a zigzag row on the side of the branch.

The individual calyces are dome-shaped verrucæ, often hemispherical when the polyps are completely retracted. They are somewhat closely approximated on the sides of the branches and are rendered conspicuons by their dark red color in contrast with the dull yellow of the cœnenchyma. A typical calyx measures .7 mm. in height and 1.3 mm. in diameter at the base. Their walls are filled with coarse tuberculate spindles which sometimes tend to an en chevron arrangement around the margin and otherwise are horizontal or irregularly disposed. A few of the more superficial spicules are yellow, but the rest are red, the predominating color in the calyces. The polyps are retractile and have a strong collaret composed of about three horizontal rows of red tuberculate spindles, above this other spindles are arranged en chevron over each tentacle base, forming a series of 8 points above the collaret. The remainder of the dorsal surface of the tentacles bears longitudinal yellow spindles.

Spicules. These are mostly rather stout terete spindles, sometimes assuming an oval outline, and with definite whorls of promiment tubercles on the more slender spindles and with irregularly placed tubercles on the stouter ones. There are also a number of clubs, most of which are tuberculate rather than thorny. Many of the spindles are curved.

Color. The colony is red and yellow. The cœnenchyma is a dull yellow, owing to the red axis showing through the yellow layer of spicules. The calyces are dark dull red with a few superficial yellow spicules. The polyps are red and yellow.

General distribution. The type locality of this species is Samboangan Reefs. It has also been reported from the Indian Ocean by Thomson and Simpson.

2. *Acabaria tenuis* Kükenthal.

Acabaria tenuis Kükenthal. Die Gorgonidenfamilie der Melitodidæ, Zoolog. Anz. Bd. XXXIII, 1908, p. 195.

Stat. 117. 1°0'.5 N., 122°56' E. 80 meters. Sand and coral.
Stat. 144. Anchorage north of Salomakieë (Damar) Island. 45 meters. Coral bottom and Lithothamnion.

A number of fragments were secured. The largest is flabellate and not reticulate, exceedingly delicate and fragile. Height 5.8 cm., spread 2.1 cm. The main stem forks 7.1 mm. from its proximal end, one of the resultant branches being missing. The stem is only 18 mm. in diameter. The branching is in general dichotomous. The distal branches are less than .5 mm. in diameter between the calyces. The basal node of the stem is 2 mm. long, while the internode below it is 5 mm. long. Some of the distal internodes are 8 mm. long. The branching is dichotomous, as a rule, and the furcations are Y-shaped rather than U-shaped. The calyces are lateral in position and vary greatly in size as well as in spacing. They average about 1.5 mm. apart.

The individual calyces are tubular in form and more prominent than is usual in this family. A typical one measures .9 mm. in height and 1 mm. in diameter at the base. The calyx walls are filled with spindles which are irregularly horizontal on the basal parts and arranged en chevron on the distal parts, arising in 8 blunt points around the margin. The polyps are retractile, but are often seen with their collarets resting just above the calyx margin. The polyps are armed with yellow spicules. There is a collaret of relatively heavy spindles in two or three rows, those of the upper row forming low points, each point consisting of the approximated distal ends of two spicules on the tentacle base. Above these points a few other spindles form a rude en chevron arrangement which is succeeded by vertically placed spindles on distal parts of tentacles.

The cœnenchyma is thin and contains spindles and spiny clubs usually disposed longitudinally.

Spicules. In this species there is a relatively large number of slender curved spindles, most of which bear regular whorls of verrucæ. Others bear irregularly distributed thorny points. Clubs with thorny points are also found, but are much less numerous than the spindles. Besides these there are a number of irregular forms, as in all species of this family; but none are sufficiently numerous to be regarded as characteristic of the species.

Color. The colony is a bright scarlet and the polyps are white with chrome yellow spindles. The spicules are red and yellow.

General distribution. The type locality is Sagami Bay, Japan; 600 meters. It has also been reported from Okinose Bank, Japan; 80—260 meters.

The specimen from Station 114 is very delicate, with reddish polyps. It is referred with some doubt to this species.

3. *Acabaria formosa* new species. (Plate VII, figs. 3, 3*a*; Plate XII, fig. 3).

Stat. 240. Banda Anchorage. 9 to 45 meters. Black sand and coral. Lithothamnion bank in 18—36 meters.

The specimens consist of a number of fragments which are exceedingly fragile and brittle. One of the larger fragments consists of a branch 8 cm. long. The denuded axis of the main stem of the branch is 1.9 cm. long and is round, having a diameter of 1.2 mm. It bifurcates at the first node which is triangular in form, 2.8 mm. long and almost equilateral. Each of the branches bifurcates twice, but one resultant branchlet is missing, and the branches are separated by a comparatively wide angle. The furcation is angular and not U-shaped as in so many species of this genus. The internodes of the branches are fairly even, averaging about 1.4 mm. long and 1.5 mm. in diameter between the calyces. The calyces are all lateral and usually alternate, those on one side often showing a tendency to bend alternately to the front and back, like the teeth of a saw.

The individual calyces are very large and conspicuous and their golden yellow color is remarkably vivid. They are in the form of symmetrical truncated cones, a typical one measuring 1.7 mm. high and 2.1 mm. broad at the base. Their walls are straight and do not curve to the general level of the cœnenchyma, as is usually the case, but are sharply differentiated from their very bases. The distance between adjacent calyces varies, but 1.5 mm. seems fairly typical. The margin bears 8 regular scallops or lobes, the polyps are retractile, but usually rest with their collarets just above the calyx margins. They are heavily spiculated, with a well-marked collaret composed of strong bent spindles in two or three encircling rows. Above the collaret the spindles are arranged en chevron over the tentacle bases, forming 8 strong points, each point being composed of a bundle of spindles. Beyond these points the dorsal surfaces of the tentacles are armed with longitudinal spindles.

Spicules. These are thorny spindles and clubs. The spindles are usually more slender than in most Melitodidæ and often curved. They are relatively quite numerous. There are also small spindles with two whorls of verrucæ in addition to the terminal knobs. The characteristic clubs show a proximal comparatively smooth acicular part and a clavate distal portion armed with numerous spiny points. The spicules of the axis are deep crimson.

Color. The colony in general, including the polyps, is a very vivid chrome yellow and the axis is bright crimson. The cœnenchyma is thin and allows the color of the axis to show through as a bright pink. This is one of the most brilliantly colored species that I have seen.

Acabaria formosa is allied to *A. biserialis* Kükenthal, but is stouter, and the calyces are much larger.

4. *Acabaria hicksoni* new species. (Plate VIII, figs. 3, 3*a*; Plate XII, fig. 4).

Stat. 60. Haingsisi, Samau Island near Timor. Reef. 23 meters. Lithothamnion in 3 meters and less.

Specimens consisting of a number of fragments. The largest is sub-flabellate in form and very erratic and straggling in its manner of growth. The proximal part is gone, and its form is such that it is difficult to tell which is the main stem or branch. The specimen is 6.6 cm. in length and about 3.5 cm. in spread. The largest branch is 1.5 mm. in diameter between the calyces. The nodes are not sharply distinguished from the internodes, and are not so distinctly triangular in shape as is often the case. They vary from 2.5 mm. (proximal) to 1.2 mm. (distal) in length. The internodes vary from 4 mm. (proximal) to 13 mm. (distal) in length. The branching is such that the greater part of the specimen is in two parallel planes. The branching is dichotomous, as a rule, but there are a number of ultimate lateral branchlets. The furcations are Y-shaped rather than U-shaped. The calyces are mainly lateral in position, where they are rather close set and tend to an alternate position.

The individual calyces are in the form of low domes when the polyps are completely retracted, and short tubes when they are expanded. A typical one measures 1 mm. in height and 1.2 mm. in diameter. The spiculation of the calyx walls shows a basal arrangement of horizontal spicules, but an en chevron arrangement toward the margins. The polyps, in partial retraction, form a strongly marked 8-rayed figure or rosette when viewed from above. There is a well-marked collaret of reddish spicules, above which is an en chevron arrangement of spindles on the tentacle bases which blends in color from red to yellow. The remainder of the dorsal surfaces of the tentacles are provided with longitudinal yellow spindles, and an oblique series of spindles is on each side of the tentacle extending from the dorsal surface to the pinnule bases, forming an armature that is unusual in this family.

Spicules. These are much as in *Acabaria tenuis* Kükenthal. The spindles seem to be a little heavier on the average, but I fail to find any specific differences, so far as the form of the spicules is concerned.

Color. The colony is a dark red and the polyps are red and yellow.

This species differs from *Acabaria tenuis* in being of a more robust habit, in irregularity of branching, in larger calyces and thicker branches and in the spiculation of the polyps.

5. *Acabaria triangulata* new species. (Plate VIII, figs. 2, 2*a*; Plate XII, fig. 5).

Stat. 260. 5° 36'.5 S., 132° 55'.2 E. 90 meters. Sand, coral and shells.
Stat. 274. 5° 28'.2 S., 134° 53'.9 E. 57 meters. Sand and shells, stones. (Type locality).

The colony is sub-flabellate in form, 6.3 cm. high and 1.5 cm. broad. The stem and branches are round in section. The main stem is 1.5 cm. long to the first branch and 1.9 cm. in diameter. The second node is 3.8 mm. long and 3 mm. broad, and a distal node is 1 mm.

long. The second internode is 6 mm. long, and a distal one 8 mm. long. The main stem bifurcates 1 5 cm. from its base into two irregular branches which are erect and nearly parallel, giving off alternate branchlets, one from each node. The largest branch is sinuous. The distance between branches varies, as do the length of the internodes. The calyces are lateral in position, not so crowded as in many species, and leave proportionally broader naked areas on the back and front of the branches.

The individual calyces are quite small dome-shaped verrucæ which show as dark red swellings in contrast with the lighter red of the cœnenchyma. An average calyx measures .5 mm. in height by .7 mm. in diameter, thus being smaller than any other species of this genus in the collection. The calyx walls are filled with Stachelkeulen the spiny points of which give a bristling appearance. The polyps are very small, retractile and, on account of their red color being the same as that of the calyces, hard to study. The spiculation, however, seems to be the same as in allied species, consisting of a collaret of transverse spicules above which 8 points are formed by two or more spindles on each tentacle base meeting at an angle, and a distal series of longitudinal spindles on the dorsal surfaces of the tentacles.

Spicules. These are quite different from those of other species of the genus the most characteristic ones being triangular in outline with their surfaces covered with large warty tubercles. These triangles are large, and are modifications of the spiny club type, many of them showing short thorny or foliaceaous projections from their club end. Both Blattkeulen and Stachelkeulen are found, the latter predominating. Ordinary spindles are rather rare. When present they are usually short, curved and ornamented with whorls of verrucæ.

Color. The colony is a dark, rather dull, coral red and the calyces and polyp spindles a dark crimson red.

Genus **Mopsella** Gray.

Mopsella Gray. Proceedings Zoological Society of London, 1857, p. 248.
Mopsella Ridley. Zoological Collections H. M. S. Alert, 1884, p. 258.
Mopsella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 31.
Mopsella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXVI.
Mopsella Kükenthal. Die Gorgonidenfamilie der Melitodidæ, Zoolog. Anz. Bd. XXXIII, 1908, p. 198.

The original definition of this genus is not at present accessible to the writer. RIDLEY (1884) emphasizes the necessity of depending largely on spicule characters in defining genera of this family.

STUDER (1887) gives as the character of the genus the penetration of the internodes by the water-vascular canals and the presence of spindles and foliaceous clubs among the spicules.

KÜKENTHAL (1908) gives the first satisfactory definition of the genus, which may be translated as follows:

"Colonies usually flabellate. The branching is dichotomous and from the nodes. Axis usually penetrated by water-vascular canals. Cortical spindles foliaceous clubs. Polyps in low calyces on the sides and one surface of the usually not flattened branches".

This definition is a satisfactory one for our present purpose, and will be adopted.

The type species of this genus is *Mopsella textiformis* (Lamarck). Other described species are *Mopsella amboynesis* Kükth., *M. clavigera* Ridley, *M. dichotoma* (Pallas), *M. coccinea* (Ellis and Solander), *M. klunzingeri* Kükth., *M. sanguinea* Kükth., *M. zimmeri* Kükth.; and the new species described beyond.

1. *Mopsella clavigera* Ridley.

Mopsella clavigera Ridley. Zoological Collections H. M. S. Alert, 1884, p. 360.

Stat. 53. Bay of Nangamessi, Sumba. Up to 36 meters. Coral sand. Near the shore, mud.

A fragmentary specimen from this station shows the strongly compressed axis and main stem, and peculiar spicules figured by RIDLEY, l. c. Plate XXXVIII, fig. a, a′, a‴, for *M. clavigera*. The specimen is dry and nearly all of the branches are missing. The internodes are pinkish and the nodes crimson. The calyces and polyps can not be satisfactorily studied.

Spicules. The spicules are exceedingly various in form, but those figured by RIDLEY are quite characteristic. There are numerous clubs with comparatively smooth surfaces, and others flattened and longitudinally grooved, forming figures like two or three extended fingers flattened and closely pressed together. Many also are like irregular potatoes in form, with rounded swellings unlike other verrucæ, and sometimes thorny points. Regular tuberculate spindles with the verrucæ in symmetrical whorls are also found.

Color. The colony is dull red and the axis has pink internodes and crimson nodes.

General distribution. The type locality of this species is in the Indian Ocean.

2. *Mopsella studeri* new species. (Plate IX, figs. 41*a*; Plate XII, fig. 6).

Stat. 71. Makassar and surroundings. Up to 32 meters. Mud, sand with mud, coral.
Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands (Pearl Banks). 13 meters. (Type locality).
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 meters. Sand and shells. Stones.

Colony flabellate and reticulate, 25.3 cm. high and with a spread of 11.5 cm. Two main stems are coherent at base, forming a common stock 1.5 cm. × 1 cm. in diameter. These separate about 2 cm. from the base, but are reunited by a single anastomosis of the branches. Stem and branches laterally compressed, the larger stem having a cross section of 9 mm. × 7 mm. In the lower part of the main stem the nodes blend with the internodes so as to make it difficult to ascertain their limits on superficial examination, but the nodes are evidently much longer than the internodes. On the branches and twigs this relation is reversed, the internodes being much the longer. Some of the distal nodes are but 2 mm. long, while adjacent internodes are 11 mm. long. The branching is dichotomous in general, but sometimes lateral and alternate. The furcations are usually U-shaped. Some of the main branches are much compressed, one having a section of 3.8 mm. × 2 mm. The ultimate twigs are nearly round and average about 1 mm. in diameter, the calyces are very thickly emplanted on three sides of the stem and main branches and on all sides of the smaller branches and twigs.

The individual calyces are quite small dome-shaped verrucæ when the polyps are completely retracted, and short tubes when they are completely expanded. They are so closely crowded on the surfaces of the branches as to be contiguous at their bases. A typical one measures .9 mm. in diameter at the base. The height varies in accordance with the state of expansion of the polyps, but seldom exceeds 1 mm. The calyx walls are armed with very jagged spindles and Blattkeulen and, in certain stages of contraction of the polyps, the margin is distinctly 8-lobed. The polyps have a rather slender collaret, above which the spindles form eight points. Beyond these points there are a few longitudinal spindles, lying along the dorsal surfaces of the tentacles. Minute spindles also extend from the dorsal surfaces diagonally to the pinnule bases.

Spicules. The most characteristic forms are remarkable Blattkeulen which consist of a tuberculate base from which project a number of parallel flattened finger-like points. Or they may be likened to a plate which has been shattered by several vertical fissures. There is complete intergradation between these Blattkeulen and typical Stachelkeulen, so that it is hard to differentiate them. Besides these curious forms there are regular spindles often curved, from the polyps, and clubs, besides a great variety of nondescript forms.

Color. The colony is a rather dull yellowish brown. The spicules are colorless.

3. *Mopsella spongiosa* new species. (Plate VIII, figs. 1, 1*a*, Plate XII, fig. 7).

Stat. 273. Anchorage off Pulu Jedan, East coast of Aru Islands (Pearl Banks). 13 meters. Sand and shells.

Colony strictly flabellate and reticulate, spongy in texture and not so delicately branched as in the other species, although the meshes are fine. Height of colony 21.5 cm. Spread 20 cm. The main stem is irregular in section, but not appreciably flattened, and is 14 mm. in diameter. About 18 mm. from its base it breaks up into numerous branches which redivide to make the mesh. In the main stem the nodes and internodes are hardly distinguishable. In one of the main branches the proximal node is 7.5 mm. long and 5 mm. in diameter, while the proximal internode is 2.3 mm. long and 3 mm. in diameter. The nodes are much swollen and longer than the internodes throughout the basal parts of the colony. A node near the edge of the fan is 4 mm. long, while the internode just below it is 11 mm. long and 1.6 mm. in diameter. Most of the branches are somewhat flattened, but the distal twigs are round. The meshes are small, usually oblong, and the anastomoses are usually, but not always, at the nodes. The calyces are emplanted very thickly on these sides of the main branches and on all sides of the distal ones.

Spicules. The most typical form of spicule in this species is the foliaceous club, with an irregular densely tuberculate basal part and a distal portion consisting of several flattened expansions usually extending parallel to each other and often in the same plane. Frequently these take the form of coarsely tuberculate spindles from one side of which the foliaceous expansions arise, making "unilateral" spindles. These Blattkeulen are exceedingly varied in form. There are also many spindles, some with irregular verrucæ, and others with verrucæ in regular whorls. Bent spindles are found in the polyps.

Color. The colony is a very dull grayish brown, like that of many sponges. The axis is dull crimson and the polyps are colored like the cœnenchyma.

Genus **Wrightella** Gray.

Wrightella Gray. Catalogue of the Lithophytes in the British Museum, 1870, p. 31.
Wrightella Ridley. Zoological collections of H. M. S. Alert, 1884, p. 580.
Wrightella Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 32.
Wrightella Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. XXXVI.
Wrightella Kükenthal. Die Gorgonidenfamilie der Melitodidæ, Zoolog. Anz. Bd. XXXIII, 1908, p. 200.
Wrightella Thomson and Mackinnon. Alcyonarians collected on the Percy Sladen Trust Expedition, Part II, 1910, p. 199.

The earliest definition of this genus at present at hand is that of STUDER (1887) which is as follows:

"Comprimirte Äste und Zweige, die vorragenden Polypenkelche vorwiegend an den Seiten. In der Rinde Blattkeulen. Keine Nährkanale in der Axe".

WRIGHT and STUDER (1889) simply give a translation of the above definition.

KÜKENTHAL (1908) defines the genus as indicated in the following translation:

"Colonies flabellate. Branches flattened and arising from the nodes. No water-vascular canals in the axis. In the outer cortex there are small spherical spicules which are derived from foliaceous clubs. The polyps are lateral or on one surface".

THOMSON and MACKINNON (1910) say that *Wrightella* is characterized by distinctive spicules: "short clubs with very broad flanges. The heads of these clubs form a compact pavement in the cœnenchyma, producing an almost roe-like appearance, as in species of Bebryce".

The type species of this genus is *Wrightella coccinea* Gray. Other species are *Wrightella variabilis* Thomson and Henderson, *W. tongaensis* Kükth. and the new species in the Siboga collection.

1. *Wrightella coccinea* Gray.

? *Isis cocinnea* Ellis and Solander. Natural History of Zoophytes, 1786, p. 107.
? *Isis coccinea* Esper. Pflanzenthiere, I, 1781, p. 280.
Melitæa de Risso Lamouroux. Histoire Polypiers coralligènes flexibles, 1816, p. 463.
Melitæa coccinea Lamarck. Histoire Naturelle des Animaux sans Vertèbres, 2nd Edit., Vol. II, 1836, p. 473.
Wrightella coccinea Gray. Catalogue of the Lithophytes in the British Museum, 1870, p. 32.
Wrightella coccinnea Ridley. Zoological collections of H. M. S. "Alert", 1884, p. 581.
Wrightella coccinea Hickson. Alcyonaria of the Cape of Good Hope, II, 1904, p. 219.
Wrightella coccinea Thomson and Mackinnon. Alcyonarians collected on the Percy Sladen Trust Expedition, Part II, 1910, p. 200.

Stat. 117. 1°0'.5 N., 122°56' E. 80 meters. Sand and coral.

Colony (incomplete) flabellate and reticulate, 12.5 cm. long. Main stem, to first branch, 3 cm. long. Second horny node 4.5 mm. broad and 4 mm. long. Calcareous internodes 2.1 mm. broad and 4.5 mm. long. The nodes grow proportionally shorter and the internodes longer until on the distal parts of the colony the former are but 2 mm. long and the latter reach a length of 16 mm. The stem forks at the 5th node. The branches are somewhat compressed laterally. The branching is partly dichotomous and partly alternate, all branches springing from the horny joints and anastomosing through the joining of the ultimate twigs. The calyces are on three sides of the colony, except on the distal twigs where they are on all sides. These latter are quite slender, being but little over 1 mm. in diameter.

The individual calyces are low domes when the polyps are retracted and truncated cones when they are partly expanded. They are rather regularly spaced, more so on the sides than on the front of the colony. A typical calyx measures .6 mm. in height and 1.1 mm. in diameter. The calyx walls, as well as the general cœnenchyma, are packed with foliaceous clubs or Blattkeulen which appear when in situ and viewed under a low magnification as rounded bodies or nodules, because they are thus seen "end on", in the calyx walls, the foliaceous ends being directed upward and outward. The polyps are heavily spiculated, with a strong collaret of bent tuberculate spicules. Above these each tentacle base is provided with two spicules whose ends meet at a wide angle forming an upward directed point. The dorsal surfaces of the tentacles are covered with longitudinal tuberculate spindles.

Spicules. The surface of the cœnenchyma is packed with vertically placed typical Blattkeulen with their foliaceous ends directed outward. These spicules are very characteristic of the genus *Wrightella*, consisting of a basal, irregular, often much branched and tuberculate portion, and a distal part composed of foliaceous expansions gathered together into a globular "head" resembling the bud of a tulip or rose and forming what appears to be a rounded nodule when the spicules are viewed in situ under low magnification. Other Blattkeulen are seen with wide foliaceous expansions which are flattened and longitudinally shattered or split. These are often seen in the distal parts of the calyx walls. Curved, tuberculate spindles are found in the polyps and tentacles.

Color. The colony is almost a brick red, or light scarlet. The polyps are yellow and the axis deep crimson.

General distribution. The type locality seems to be the coast of Mauritius (Ellis and Solander). It has also been reported from the Seychelles, 4—12 fathoms (Gray); from the Indian Ocean, Farquaar Atoll, Prashu, Seychelles (Thomson and Mackinnon), and from the Cape of Good Hope (Ridley).

2. ? *Wrightella tongaensis* Kükenthal.

Wrightella tongaensis Kükenthal. Die Gorgonidenfamilie der Melitodidæ, Zoolog. Anz. Bd. XXXIII, 1908, p. 200.

Stat. 240. Banda Anchorage. 9 to 45 meters. Black sand, coral.
Stat. 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27 to 54 meters. Sand, coral and Lithothamnion.

Colony subflabellate, not truly reticulate, although there are occasional anastomoses, very profusely branched, forming a flattened clump. Height 11.2 cm., spread 12 cm. The basal part is lacking, the proximal node of the stem is 9 mm. in diameter and the only remaining internode is flattened and has a cross section of 8 mm. × 5 mm. and a length of 6 mm. This internode, however, appears to be really two coalesced internodes which have branched from the preceding node and adhere throughout their length. As is usual the nodes decrease in length while the internodes increase from the proximal to the distal parts of the colony until the nodes are but 2 mm. in length while the internodes are sometimes as much as 18 mm. long. The branching is irregularly dichotomous and the branches are round in section, the distal twigs being but 1 mm. in diameter. The calyces are thickly emplanted on three sides of the stem and branches, leaving the posterior face of the colony conspicuously bare.

The individual calyces are dome-shaped verrucæ when the polyps are completely retracted and truncated cones when they are expanded. They are rendered very conspicuous by the fact that the upper parts of their walls are rich carmine while the lower parts of the walls and general cœnenchyma of the branches are orange yellow. A typical calyx is .8 mm. high and 1.3 mm. in diameter. The polyps are heavily spiculated with a collaret composed of three or four rows of strong tuberculate spindles above which a pair on each tentacle base form a point by the meeting of their distal ends. Above these points each tentacle bears a triangular area of spicules, some of which are Stachelplatten with jagged projections. All of these spicules are brilliant red, in sharp contrast with the white of the tentacles themselves.

Spicules. These are exceedingly various, the most characteristic being Blattkeulen, small in size, with their folia compressed into a knob or ball resembling a closed bud. These are superficial on the calyces and general cœnenchyma. Besides these there are a number of ordinary spindles, clubs, bent spindles and variously branched forms, with occasional unilateral spindles and Stachelplatten.

Color. The colony is a brilliant orange with the marginal areas of the calyces, polyp spicules and axis bright crimson. The polyps are white. This is one of the most strikingly colored forms that I have seen among the Melitodidæ.

General distribution. The type locality of this species is Tonga Islands (KÜKENTHAL).

Genus **Parisis** Verrill.

Parisis Verrill. Bulletin Museum of Comparative Zoology, 1864, p. 67.
Parisis (in part) Gray. Catalogue of the Lithophytes in the British Museum, 1870, p. 13.
Parisis Ridley. Annals and Magazine of Natural History, 5th series, Vol. X, 1882, p. 130.
Parisis Studer. Versuch eines Systemes der Alcyonaria, 1887, p. 32.
Parisis Wright and Studer. Challenger Report, the Alcyonaria, 1889, p. 181.
Parisis Delage et Hérouard. Traité de Zoologie Concrète, II, 2, 1901, p. 414.
Parisis Kükenthal. Die Gorgonidenfamilie der Melitodidæ, Zoolog. Anz. Bd. XXXIII, 1908, p. 190.

The original definition for this genus is not at hand.

RIDLEY (1882) says that *Parisis* differs from *Trinella* Gray in having spicular verrucæ.

STUDER (1887) defines the genus as shown in the following translation:

"Branches differ from all other Melitodidæ in springing from the calcareous joints. The exserted calyces are borne on the outer periphery of the thinner branches. The spicules resemble those of *Isis*, being thick, irregular, often with a median constriction and beset with verrucæ".

This writer says that *Trinella swinhoei* Gray is really the axis of a *Parisis* overgrown by a sponge and bearing *Polythoa* which GRAY mistook for the polyps of his *Trinella*.

The type of this genus is *Parisis fruticosa* Verrill. The only other known species is *P. minor* Wright and Studer.

WRIGHT and STUDER regard *Parisis mauritiensis* Ridley as a synonym for *P. fruticosa*, and THOMSON and SIMPSON conclude that *P. indica* Thomson and Henderson should also be relagated to the same well-known form.

1. *Parisis fruticosa* Verrill.

Parisis fruticosa Verrill. Bulletin Museum of Comparative Zoology, I, 1865, p. 23.
? *Trinella swinhoei* Gray. Catalogue of Lithophytes in the British Museum, 1870, p. 12.
Parisis mauritiensis Ridley. Annals and Magazine of Natural History, 5th series, Vol. X, 1882, p. 131.
Parisis fruticosa Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 182.
Parisis indica Thomson and Henderson. Alcyonarians of the Indian Ocean, I, 1906, p. 23.
Parisis fruticosa Thomson and Simpson. Alcyonaria of the Indian Ocean, II, 1909, p. 176.

Stat. 204. 4° 20′ S., 122° 58′ E. From 75 to 94 meters. Sand with dead shells.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 meters. Sand, coral and shells.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 meters. Sand and shells. Stones.

Colony subflabellate in form, 46.5 cm. in height, with a spread of about 15 cm., and extensively encrusted with a sponge. The base of attachment is lacking. The stem and all branches are round, the former being 7 mm. in diameter and 5.5 cm. long to first branch. The calcareous and horny segments are equal in diameter and not externally evident, except in the stem and larger branches. The nodes vary from 4 mm. (proximal) to less than 1 mm. (distal) in length. The calcareous internodes are more constant in the sense that their extreme variation is less, but do not increase as regularly from proximal to distal parts of the colony as in many species of this family. They vary from 2 to 6 mm. in length. The main stem gives off a number of small irregular lateral branches, four of which are compound, from its proximal 10 cm., and the stem bends outward and then upward. It then forks into two unequal parts and each of these gives off numerous lateral branchlets both simple and compound, some of which rebranch until branchings of the 6th order are attained. The ultimate twigs are about 1.3 mm. in diameter, measured between the calyces. These latter are rather thickly distributed on all sides of the distal branchlets, but usually they are on but three sides of the branches and on some they are strictly lateral.

The individual calyces are dome-shaped. but tilted so that their summits are inclined toward the distal ends of the branches. A typical one measures 1.4 mm. high and 1.2 mm. in diameter near its base. The calyx walls are filled with a neatly fitted mosaic of polygonal spicules whose edges form close joints and do not seem to overlap. The polyps are very minute, and their attachment to the inside of the calyx, when strongly contracted, is so firm that satisfactory investigation is very difficult. They are either devoid of spicules or very feebly spiculated.

Spicules. These are heavy plate-like forms of various shapes, but usually polygonal. Their surfaces are covered with heavy rounded verrucæ so thickly compacted as to be often contiguous. Some of the smaller ones are radiate, stellate or cruciform. The larger ones sometimes attain a length of .6 mm.

Color. The specimen is a dull purplish or purplish brown, due largely to the presence of the sponge. The nodes are dark brown and the internodes ivory white. The spicules are colorless.

A few fragmentary specimens from station 310 are free from the sponge growth. They are partly creamy white and partly pinkish In one fragment the axis is a deep rose color, and the polyps seem to be of the same color.

General distribution. The type locality for this species is Soolo Sea. It has also been reported from Mauritius, Banda Sea, Australia, Formosa and the Indian Ocean.

2. ? *Parisis minor* Wright and Studer.

Parisis minor Wright and Studer. Challenger Reports, the Alcyonaria, 1889, p. 1884.

Stat. 139. 0° 11′ S., 127° 25′ E. 397 meters. Mud, stone and coral.

A single specimen, representing the terminal part of a colony is referred with doubt to this species. The fragment is 3.7 cm. long, and was broken off from the colony just below a node which is incomplete and bears on its distal end a bifurcated internode. One of the resultant branches bears a lateral branchlet on its proximal internode and bifurcates 1.5 mm. from its proximal end, or at the end of the first internode. One of the resultant branchlets is a mere stub. The other is 2.5 cm. long and has adhering to it a piece of a branchlet from a missing branch. The other main branch bifurcates twice, the furcations being Y-shaped rather than U-shaped. Its distal internode is longest, measuring 17 mm. The calyces are nearly all lateral, but a few are on the anterior face of the colony.

The individual calyces are in the form of truncated cones, a typical one measuring .8 mm. in height and 1.5 mm. in diameter at the base. The calyx walls are filled with coarse, heavily tuberculate spindles which are exceedingly irregular in arrangement. Sometimes they are disposed horizontally and at other times those around the margin are vertical, forming a rude series of irregular jagged points. The polyps are very heavily spiculated, with a relatively narrow collaret above which a group of heavy spindles are placed almost vertically at each tentacle base, forming a series of eight points. The polyps are retracted to their collarets and the infolded tentacles form a conical mass which completes the cone-shape of the calyx.

Spicules. These are heavy spindles with short branched verrucæ not in whorls. They are not so large as in *P. fruticosa* and their branching is much more evident. A number of more slender thorny spindles are found in the polyps. Although not so regular in form as represented by Wright and Studer's figures, they agree with them fairly well in essential features.

Color. The specimen described is grayish white in color.

General distribution. The type locality for this species is Hyalonema grounds, Japan 345 fath.

Genus **Birotulata** new genus.

Colony flabellate. Both nodes and internodes traversed by water-vascular canals. The branches are all borne on the nodes. Characteristic spicules double wheels.

Type species, *Birotulata splendens* Nutting.

1. *Birotulata splendens* new species. (Plate X, figs. 1, 1*a*, 2; Plate XII, fig. 8).

Stat. 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral.

The type was originally a very large colony, but has been broken into many fragments. The specimen was flabellate in form and not reticulate and probably originally measured as much as 1 meter in height. The trunk and main branches are laterally compressed, the former being 2.8 cm. × 1.9 cm. in section, and the latter as much as 2.8 cm. × 2.2 cm. in section. The main stem bifurcates 7 cm. from its proximal end into two very unequal branches. The larger of these, after giving off four branchlets, the stubs of which remain, bifurcates into two branchlets which are approximately round in section, the larger one having a diameter of 2 cm. Some of the more distal branchlets are round and others slightly compressed laterally. The branching is in part dichotomous and in part lateral, the former prevailing in the distal parts of the colony, the ultimate branchlets being 1.5 mm. in diameter. The furcations are usually U-shaped rather than Y-shaped. The calyces are on the sides and front of the colony, leaving a bare posterior space, sharply distinguished by its bright chrome yellow color, as if the colony were crudely painted scarlet on front and sides and yellow behind.

The individual calyces are closely set and have each a broad border of scarlet which gives the red color to the branches. They are almost entirely included and very small, not being over .5 mm. in diameter on the average. Their walls, like the general cœnenchyma, are filled with small smooth double-wheels. The polyps are retractile, and bear a collaret which is rather strong and composed of two or three rows of transverse red spindles. Above these a few spindles are arranged en chevron on each tentacle base, and beyond this the spindles are longitudinal. The nodes are not indicated superficially on the main stem and larger branches, and are nowhere so conspicuous as in *Melitodes ochracea.* The internodes, as well as the nodes, are penetrated by numerous water-vascular canals.

Spicules. The most conspicuous and numerous forms are the double-wheels characteristic of the genus. These are on the surface and also constitute the chief element in the cœnenchyma. They look much like two buns pressed together, sometimes unsymmetrically. Some of them have a small nodule at each end in addition to the two wheels. There are also densely tuberculate short stout spindles, and ordinary spindles, mostly from the polyps, and numerous irregular forms which are usually minute. The spicules of the axis are smooth bar-like and needle-like forms.

Color. The colony is scarlet and chrome yellow, the posterior face of the distal parts of the colony being sharply differentiated, as if painted with vivid yellow. The yellow shows also on the other sides between the scarlet borders of the calyces. The polyp spicules are scarlet. The axis is a bright yellow, a characteristic which differentiates this species from *Melitodes ochracea*. The stem and main branches are dark red. Another colony has the distal internodes creamy white and the nodes yellow.

This species bears a very close superficial resemblance to *Melitodes ochracea*.

THOMSON and MACKINNON[1] have called attention to two other cases of very close approximation of species belonging to separate genera, i. e., *Wrightella coccinea* and *Melitodes coccinea* (Esper); also *Wrightella variabilis* Thomson and Henderson and *Melitodes variabilis* Hickson. The present case is quite similar to those noted by these writers.

There is very close resemblance between *Birotulata splendens* and *Melitodes ochracea*, but the spiculation is so different as to justify a generic distinction between the two.

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[1] Alcyonarians collected by the Percy Sladen Trust Expedition. Part II, 1910, p. 200.

DISTRIBUTION OF THE MELITODIDÆ COLLECTED BY THE SIBOGA EXPEDITION

List of Stations

at which Melitodidæ were collected by the Siboga Expedition
and a List of Species collected at each Station.

Station 33. Bay of Pidjot, Lombok. 22 meters, and less. Mud, coral and coral sand. *Melitodes esperi.*

Station 50. Bay of Badjo, West coast of Flores. Up to 40 meters. Mud, sand and shells. *Melitodes esperi.*

Station 53. Bay of Nangamessi, Sumbu. Up to 36 meters. Coral sand, mud near shore. *Mopsella clavigera.*

Station 60. Haingsisi, Samau Island near Timor. 23 meters. Lithothamnion in 3 meters and less. Reef. *Melitodes variabilis, M. esperi, Acabaria hicksoni.*

Station 71. Makassar and surroundings. Up to 32 meters. Mud, sand with mud, coral. *Melitodes ochracea, Mopsella studeri.*

Station 80. 2° 25′ S., 117° 43′ E. 50 to 40 meters. Fine coral sand. *Melitodes esperi.*

Station 85. 0° 36′.5 S., 119° 29′.5 E. 724 meters. Fine grey mud. *Melitodes ochracea.*

Station 117. 1° 0′.5 N., 122° 56′ E. 80 meters. Sand and coral. *Acabaria tenuis, Wrightella coccinea.*

Station 139. 0° 11′ S., 127° 25′ E. 397 meters. Mud, stones and coral. *Parisis minor.*

Station 144. Anchorage north of Salomakieë (Damar) Island. Coral bottom and Lithothamnion. *Melitodes esperi, Acabaria tenuis.*

Station 164. 1° 42′.5 E. 130° 47′.5 E. 32 meters. Sand, small stones and shells. *Melitodes flabellum, M. esperi, M. modesta.*

Station 204. 4° 20′ S., 122° 58′ E. 75 to 94 meters. Sand with dead shells. *Parisis fruticosa.*

Station 234. Nalahia Bay, Nusa-Laut Island. 46 meters. Stony. *Melitodes ochracea.*

Station 240. Banda Anchorage. 9 to 45 meters. Black sand, coral. Lithothamnion. *Acabaria formosa, Wrightella tongaensis.*

Station 244. 4° 25′.7 S., 130° 3′.7 E. 2991 meters. Fine bluish green mud. *Mopsella studeri.*

Station 257. In Duroa Strait, Kei Islands. Up to 52 meters. Coral. *Melitodes esperi.*

Station 258. Tual Anchorage, Kei Islands. 22 meters. Lithothamnion, sand and coral. *Wrightella tongaensis, Birotulata splendens.*

Station 260. 5° 36′.5 S., 132° 55′.2 E. 90 meters. Sand, coral and shells. *Acabaria triangulata, Parisis fruticosa.*

Station 261. Elat, West coast of Great Kei Islands. 27 meters. Mud. *Melitodes flabellum.*

Station 273. Anchorage off Pulu Jedan, East coast of Aru Islands. 13 meters. Sand and shells. *Melitodes flabellum, M. esperi, M. modesta, Mopsella studeri, M. spongiosa.*

Station 274. 5° 28′.2 S., 134° 53′.9 E. 57 meters. Sand and shells, stones. *Melitodes variabilis, M. modesta, Acabaria triangulata, Mopsella studeri, Parisis fruticosa.*

STATION 282. 8° 25'.2 S., 127° 18'.4 E. 27 to 54 meters. Sand, coral and Lithothamnion. *Wrightella tongaensis.*

STATION 299. 10° 52'.4 S., 123° 1'.1 E. 34 meters. Mud, coral and Lithothamnion. *Melitodes flabellum, M. squamata.*

STATION 305. Mid channel in Solor Strait, Off Kampong Menanga. 113 meters. Stony. *Melitodes flabellum.*

STATION 310. 8° 30' S., 119° 7'.5 E. 73 meters. Sand with few pieces of dead coral. *Melitodes flabellum, Acabaria philippinensis, Parisis fruticosa.*

STATION 315. Anchorage East of Sailus Besar, Paternoster Islands. Up to 36 meters. Coral and Lithothamnion. *Melitodes esperi.*

The above list shows that Melitodidæ were collected at 26 stations, or at about 13°/o of the stations at which successful hauls were made during the Siboga Expedition. The most abundant genus of Melitodidæ in the region covered by the expedition is the type genus *Melitodes*, which was collected at 17 stations out of the 26. *Melitodes esperi* seems to be the most abundant species of Melitodidæ in the collection, having been collected at 9 stations; and *M. flabellum* is the next.

Table showing the bathymetric and geographic distribution of the Scleraxonia of the Siboga Expedition.

	BATHYMETRIC.					GEOGRAPHIC, ASIDE FROM DUTCH EAST INDIES.
	1 to 50 meters	50 to 100 meters	100 to 200 meters	200 to 500 meters	Over 500 meters	
BRIAREIDÆ.						
Solenocaulon sterroklonium	*	*	.	.	.	Indian Ocean.
Solenocaulon grayi	*	*	.	.	.	Australia, Indian Ocean.
Solenocaulon querciformis	*	.	.	.	*	
Solenocaulon jedanensis	*	.	.	.	.	
Titanidium friabilis	*	.	.	.	.	
Semperina rubra	*	.	.	.	.	Bohol, Philippine Islands.
Semperina brunnea	*	.	.	.	.	North of New Zealand.
Suberia köllikeri	.	*	.	.	*	
Suberia excavata	*	.	.	.	.	
Suberia macrocalyx	.	.	.	.	*	
Paragorgia splendens	.	.	.	.	*	
Iciligorgia orientalis	*	.	.	.	.	Indian Ocean.
SCLEROGORGIDÆ.						
Suberogorgia verriculata	*	.	.	.	*	Northwest coast of Australia, Japan.
Suberogorgia ornata	*	.	.	*	.	Indian Ocean.
Suberogorgia köllikeri	*	*	.	.	*	Japan, Ceylon, Indian Ocean.
Suberogorgia rubra	*	*	.	.	.	Ceylon.
Suberogorgia appressa	*	.	.	.	.	
Suberogorgia thomsoni	.	*	.	.	.	
Suberogorgia pulchra	*	.	.	.	.	
Koroeides koreni	.	*	.	.	*	Japan, Indian Ocean.

	BATHYMETRIC.					GEOGRAPHIC, ASIDE FROM DUTCH EAST INDIES.
	1 to 50 meters	50 to 100 meters	100 to 200 meters	200 to 500 meters	Over 500 meters	
Melitodidæ.						
Melitodes ochracea	*	.	.	.	*	Indian Ocean.
Melitodes flabellum	*	*	*	.	.	Indian Ocean.
Melitodes variabilis	*	*	.	.	.	Indian Ocean.
Melitodes esperi	*	*	.	.	.	Indian Ocean.
Melitodes squamata	*	.	.	.	.	
Melitodes modesta	*	*	.	.	.	
Acabaria philippinensis	.	*	.	.	.	Indian Ocean.
Acabaria tenuis	*	*	.	*	*	Japan.
Acabaria formosa	*	.	.	.	.	
Acabaria hicksoni	*	.	.	.	.	
Acabaria triangulata	.	*	.	.	.	
Mopsella clavigera	*	.	.	.	.	Indian Ocean.
Mopsella studeri	*	*	.	.	.	
Mopsella spongiosa	*	.	.	.	.	
Wrightella coccinea	.	*	.	.	.	Indian Ocean (Mauritius), Cape of Good Hope.
Wrightella tongaensis	*	*	.	.	.	Tonga Islands. (South Pacific).
Parisis fruticosa	.	*	.	.	.	Sooloo Sea, Indian Ocean, Australia.
Parisis minor	.	.	.	.	*	Hyalonema Grounds (Japan).
Birotulata splendens	*	.	.	.	.	

This table clearly indicates that the Scleraxonia are essentially Indo-Pacific in distribution, but five species being found so far north as Japan, four extending south to Australia and one to the Tonga Islands. *Wrightella coccinea* strays as far from the type locality as the Cape of Good Hope. Fourteen of the twenty one hitherto described species are found in the Indian Ocean, which seems the centre of distribution for the group, and not a single species is surely known to occur in the Atlantic Ocean.

In bathymetric distribution this suborder is mainly from shallow water, thirty six of the thirty nine species in the collection being found at less depths than 100 meters, and but ten species reaching a depth of over 500 meters. It is a remarkable fact that eight of the ten species referred to are also found at depths of less than 100 fathoms. The paucity of forms found between 100 and 500 meters is doubtless mainly accidental, as it is reasonable to suppose that the eight species found at less than 100 meters and over 500 meters really occur at intermediate depths.

The deepest dredging at which a species of this suborder was secured in 2264—1165 meters, where *Suberia macrocalyx* was taken. Next to this comes *Solenocaulon querciformis* from a depth of 828 meters. But the identification of this specimen is somewhat doubtful.

Literature cited

in the Report on the Scleraxonia of the Siboga Expedition.

Bourne, G. C. A treatise on Zoology. Part II, Chapter VI, 1900.

Brundin, J. A. Z. Alcyonarien aus der Sammlung des zoologisches Museums in Upsala. Bihang til k. Svenska Vet. Akad. Handlingar, Bd. 22, Heft IV, N° 3, Stockholm, 1896.

Delage et Hérouard. Traité de Zoologie Concrète. Tome II, 2me Partie, les Cœlentérés, Paris, 1901.

Duchassaing de Fontbressin, P. Revue des Zoophytes et des Spongiaires des Antilles. Paris, 1870.

Esper, E. J. C. Die Pflanzenthiere in Abbildungen nach der Natur, mit Farben erleuchtet nebst Beschreibungen. Nürnberg, 1794.

Genthe, C. Über Solenogorgia tubulosa (eine neue Gattung der Gorgoniden). Zeitschrift f. wiss. Zoologie, Bd. XVII, 1867.

Germanos, N. K. Gorgonaceen von Ternate. Abhandl. Senck. Nat. Ges., Bd. XXIII, Heft I, 1897.

Gray, J. E. Descriptions of some new Genera of Lithophytes or Stony Zoophytes. Proc. Zool. Soc. London, 1859.

—— On the arrangement of Zoophytes with pinnated tentacles. Annals and Magazine of Natural History. Vol. V, 1859.

—— Descriptions of two new Genera of Zoophytes (*Solenocaulon* and *Belonella*) discovered on the North coast of Australia by Mr. Raynor. Annals and Magazine of Natural History, Series 3, Vol. X, 1862.

—— Notes on some new Genera and Species of Alcyonoid Corals in the British Museum. Annals and Magazine of Natural History, Series 4, Vol. V, 1870.

—— Catalogue of Lithophytes or Stony Corals in the collections of the British Museum. London, 1870.

Hickson, S. J. The Alcyonaria of the Maldives, Part III, The Families Muriceidæ, Gorgonellidæ, Melitodidæ and the Genera *Pennatula, Funephthys*. Fauna and Geography of the Maldive and Laccadive Archipelagoes, Vol. II, Part IV, 1905.

Kölliker, A. Icones Histiologicæ oder Atlas der vergleichenden Gewebelehr; 2te Abtheilung, der feinere Bau der höheren Thiere; 1stes Heft, die Bindesubstanz der Cœlenteraten. Leipzig, 1865.

—— Beiträge zur Kenntniss der Polypen, 1870.

Kükenthal, W. Die Gorgonidenfamilie der Melitodidæ Verrill. Zoologischer Anzeiger, Bd. XXXIII, Nr. 7/8, 1908.

Lamarck, J. B. P. A. de. Histoire naturelle des Animaux sans vertèbres, Vol. II, Paris, 1836.

Lamouroux, J. F. V. Histoire des Polypiers coralligènes flexibles, Caen, 1816.

Linnæus, Carolus. Systema Naturæ, 10th Edition, 1758.

—— Systema Naturæ, 12th Edition, 1767.

Milne-Edwards, H. et Haime, J. Histoire naturelle des Coralliaires ou Polypes proprement dits, Tome premier, Paris. 1857.

Nutting, C. C. Alcyonaria of the Californian Coast. Proceedings of the U. S. Nationaal Museum, XXXV, Washington, 1909.

—— Descriptions of the Alcyonaria collected by the U. S. Bureau of Fisheries Steamer "Albatross" in the Vicinity of the Hawaiian Islands in 1902. Proceedings of the U. S. National Museum, Vol. XXXIV, 1909.

Pallas, A. S. Elenchus Zoophytorum, 1866.

Ridley, S. O. Report on the Zoological Collections made in the Indian Ocean during the Voyage of H. M. S. "Alert", 1881—2. London, 1884.

—— Contribution to the knowledge of the Alcyonaria, Part II, including new Species from Mauritius. Annals and Magazine of Natural History, 5th Series, Vol. X, 1882.

—— Alcyonaria of the Mergui Archipelago, 1888.

Studer, Th. Übersicht der Anthozoa Alcyonaria, welche während der Reise S. M. S. "Gazelle" um die Erde gesammelt wurden. Monatsbericht der Königlich Preussischen Akademie der Wissenschaften zu Berlin. Berlin, 1879.

—— Versuch eines Systemes der Alcyonaria. Archiv für Naturgeschichte, 53ster Jahrgang, Bd. I, Heft 1, 1887.

—— Alcyonarien aus der Sammlung des Naturhistorischen Museums in Lübeck; Separatabdruck aus den Mitteilungen der Geographischen Gesellschaft und des Naturhistorischen Museums in Lübeck, II Ser., Heft 7 und 8. Lübeck, 1894.

Thomson, J. A. Appendix to the Report on the Alcyonaria. Report to the Government of Ceylon on the Pearl Oyster Fisheries in the Gulf of Manaar. London, 1905.

—— and Mackinnon, D. A. Alcyonaria collected by the Percy Sladen Trust Expedition by Mr. Stanley Gardiner. Part II, The Stolonifera, Alcyonacea, Pseudaxonia and Stelechotokea. Transactions of the Linnæan Society of London, Vol. XIII, part 2. London, 1902.

—— and Henderson, W. D. Report on the Pearl Fisheries of the Gulf of Manaar. Supplementary Reports, the Alcyonaria. 1905.

—— and —— An account of the Alcyonaria collected by the Royal Indian Marine Survey Ship "Investigator" in the Indian Ocean. Part I, The Alcyonarians of the Deep Sea. Calcutta, 1906.

—— and Simpson, J. J. Report on the Alcyonaria collected in the Indian Ocean by the Royal Indian Marine Survey Ship "Investigator". Part II, The Alcyonarians of the Littoral Area. Calcutta, 1909.

Valenciennes, M. Extrait d'une monographie de la famille des Gorgonidées de la classe des Polypes. Comptes rendus hebdomadaires des Séances de l'Academie des Sciences, XII. Paris, 1855.

Verrill, A. E. Memoirs of the Boston Society of Natural History, I, 1863.

—— Review of the Corals and Polyps of the West Coast of America; Transactions of the Conn. Academy of Arts and Sciences, I, 2, 1867—71.

Wright, E. P. and Studer, Th. Report on the Alcyonaria collected by H. M. S. "Challenger" during the years 1873—76. The Voyage of H. M. S. Challenger, Zoology, Vol. XXXI. London, 1889.

EXPLANATION OF PLATES

The photographs were made from nature by the author.
The spicules were drawn under the camera lucida by Mr. DAYTON STONER.

PLATE I.

Fig. 1. *Solenocaulon querciformis* n. sp. Natural size. 1*a*, part of twig × 5.

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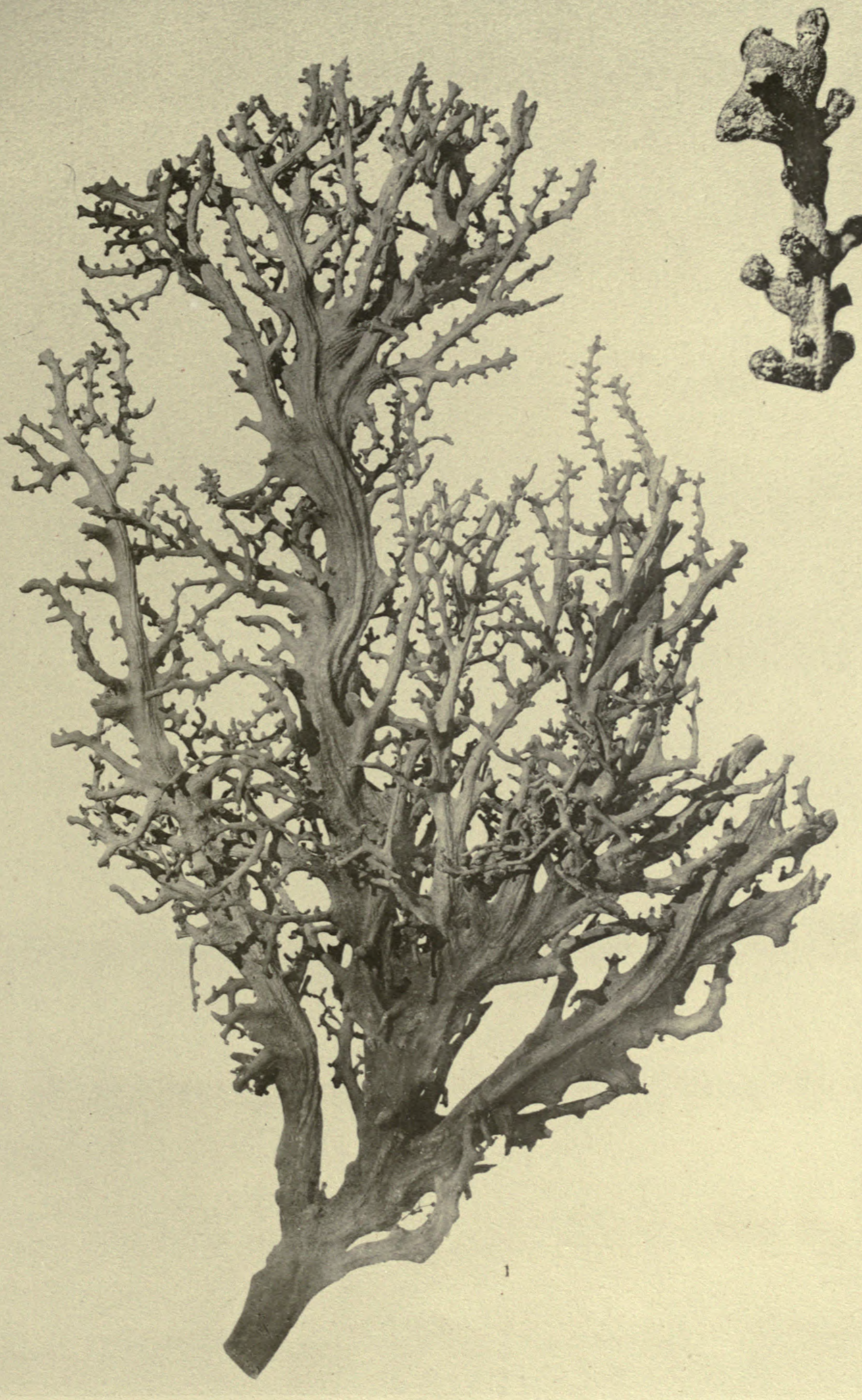

1a

1

PLATE II.

Fig. 1. *Solenocaulon jedanensis* n. sp. Natural size.	1*a*, part of twig × 5.
Fig. 2. *Semperina brunnea* n. sp. Natural size.	2*a*, part of twig × 5.

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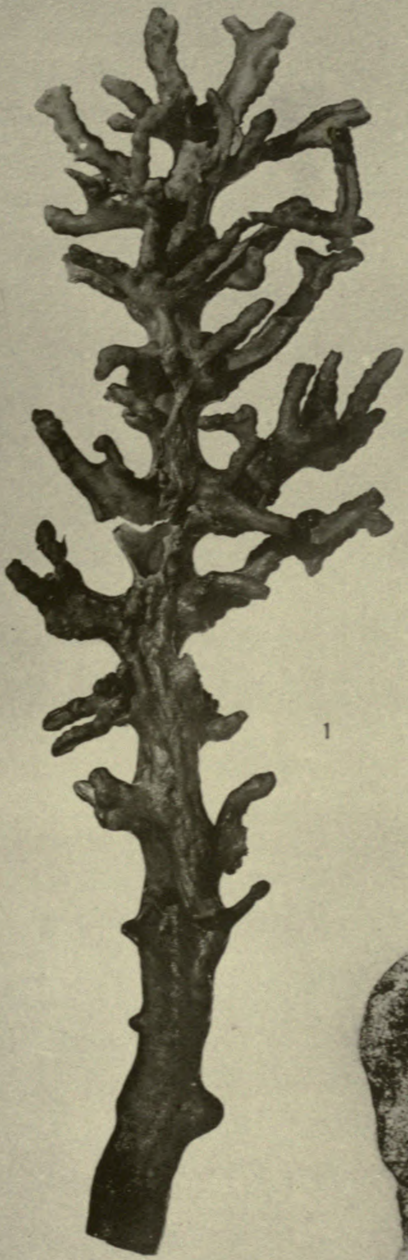

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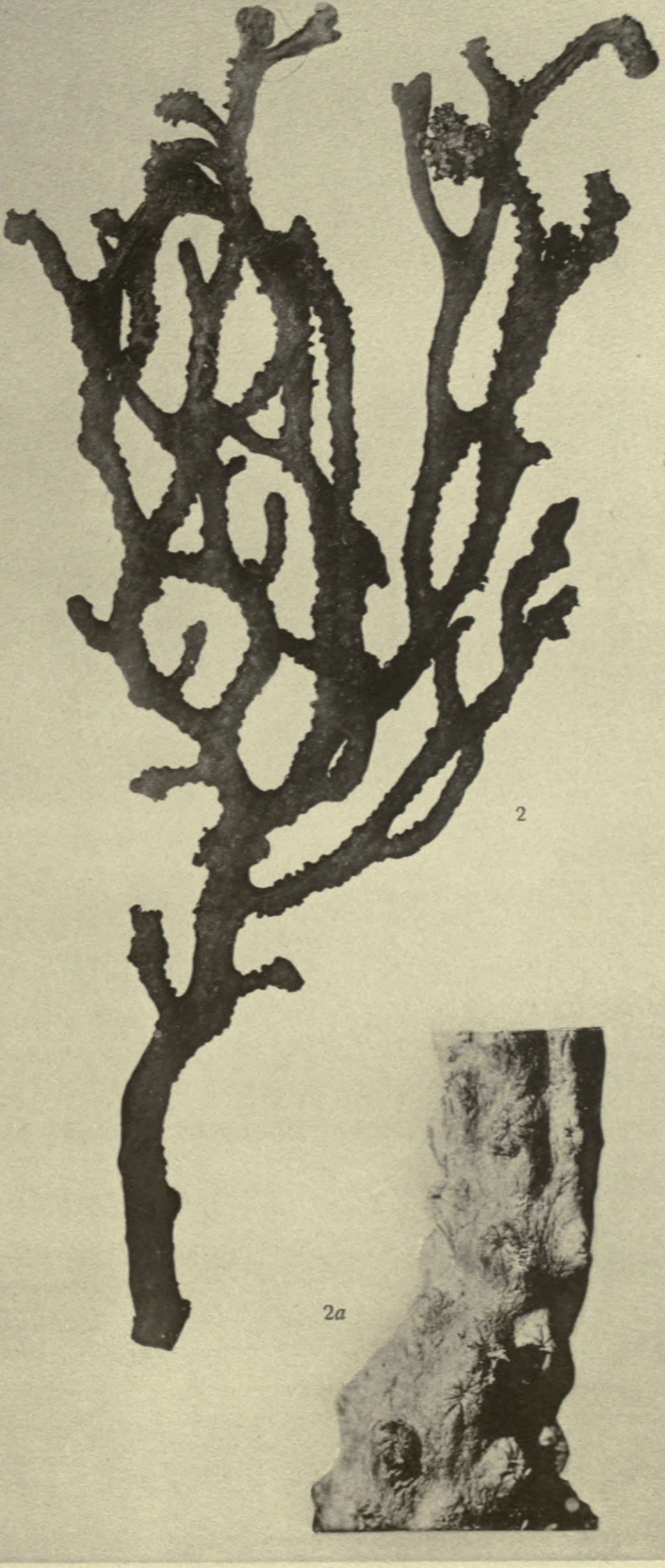
1*a*



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2*a*

PLATE III.

Fig. 1. *Titanidium friabilis* n. sp. Natural size. 1*a*, part of twig × 5.
Fig. 2. *Suberia excavata* n. sp. Natural size. 2*a*, part of branch × 5.
Fig. 3. *Suberia macrocalyx* n. sp. Natural size. 3*a*, part of branch × 5.
Fig. 4. *Paragorgia splendens* n. sp. Natural size. 4*a*, part of branch × 5.

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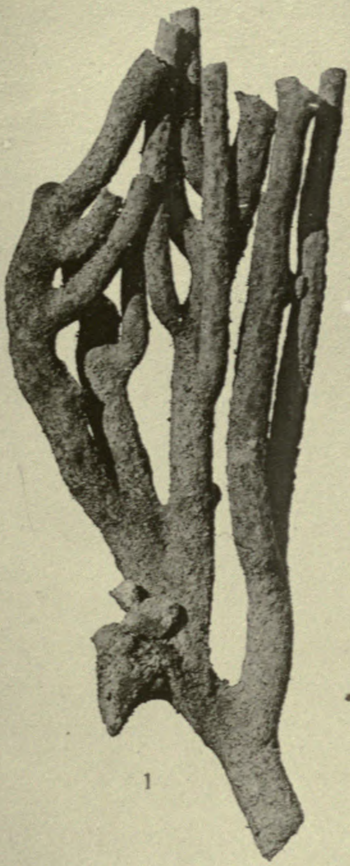

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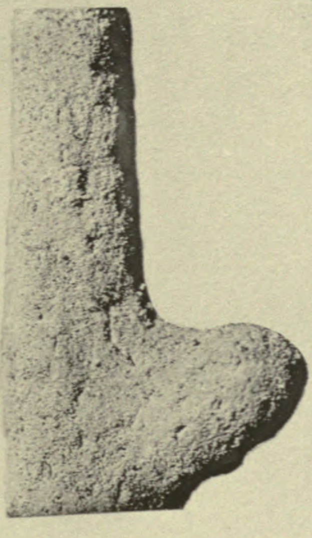

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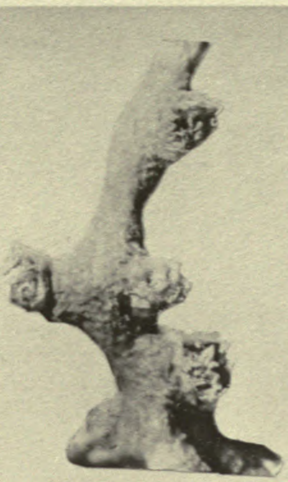

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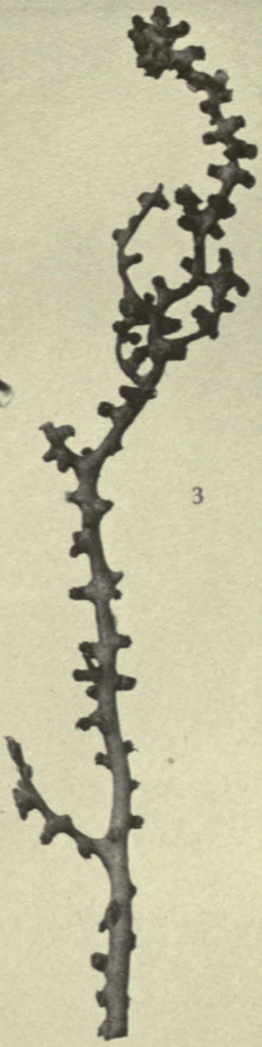

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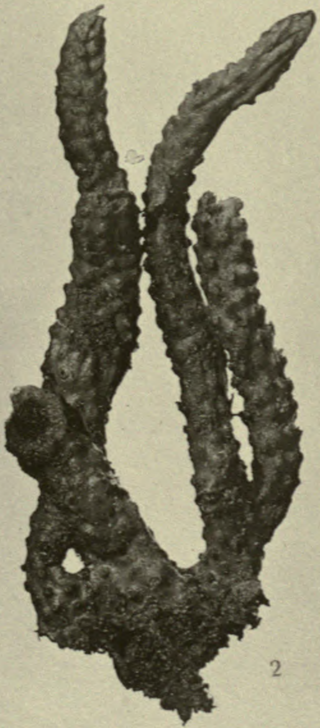

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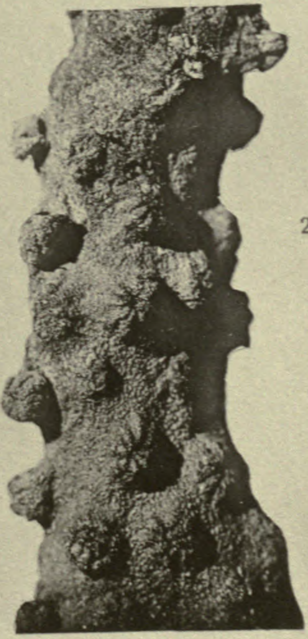

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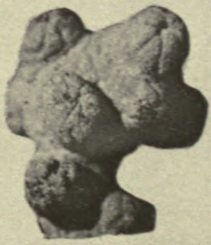

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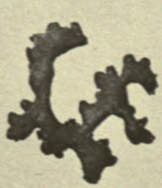

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PLATE IV.

Fig. 1. *Iciligorgia orientalis* Ridley. Natural size. 1 *a*, part of twig × 5.

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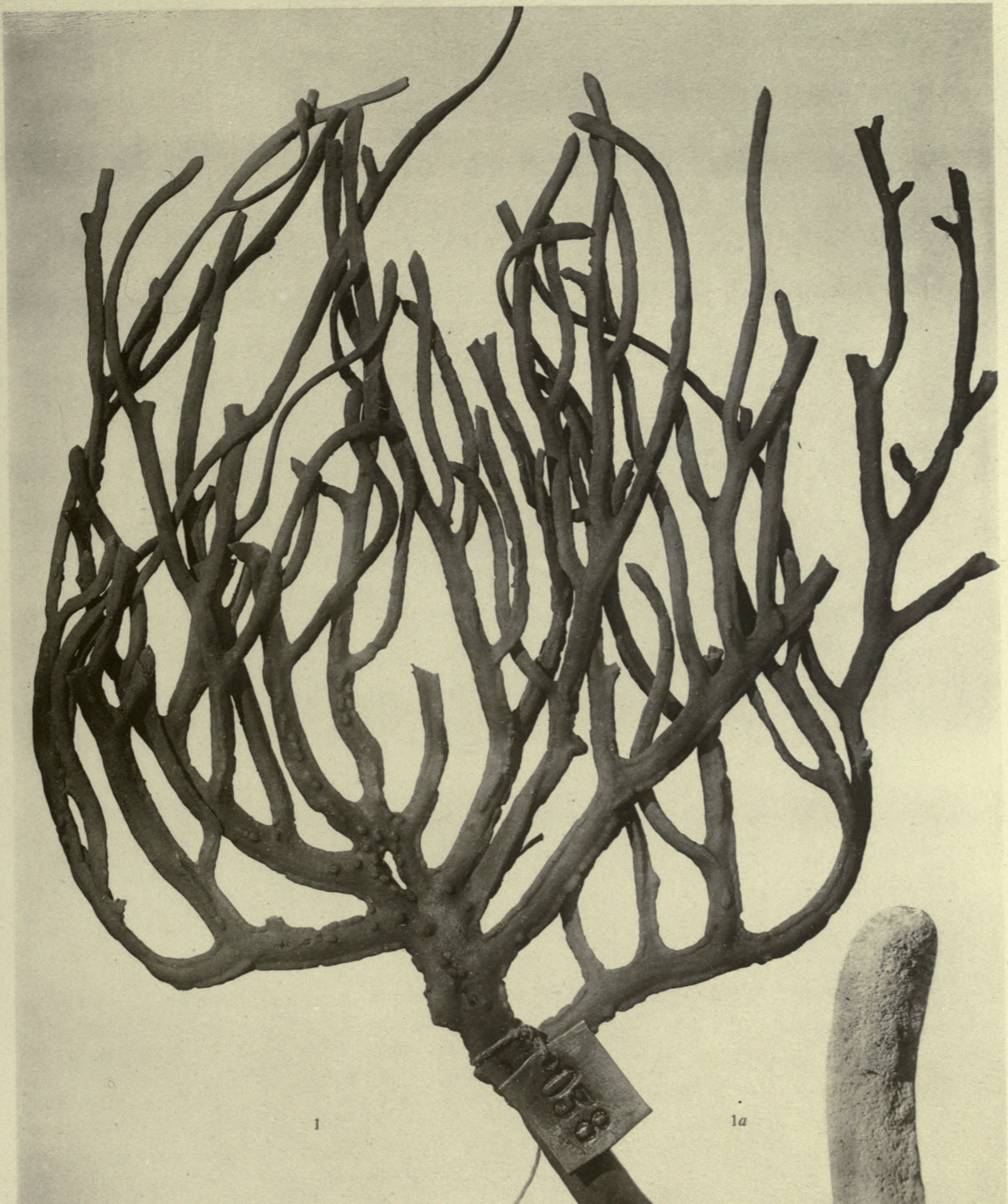

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PLATE V.

Fig. 1. *Suberogorgia appressa* n. sp. Natural size. 1 *a*, tip of branch × 5.

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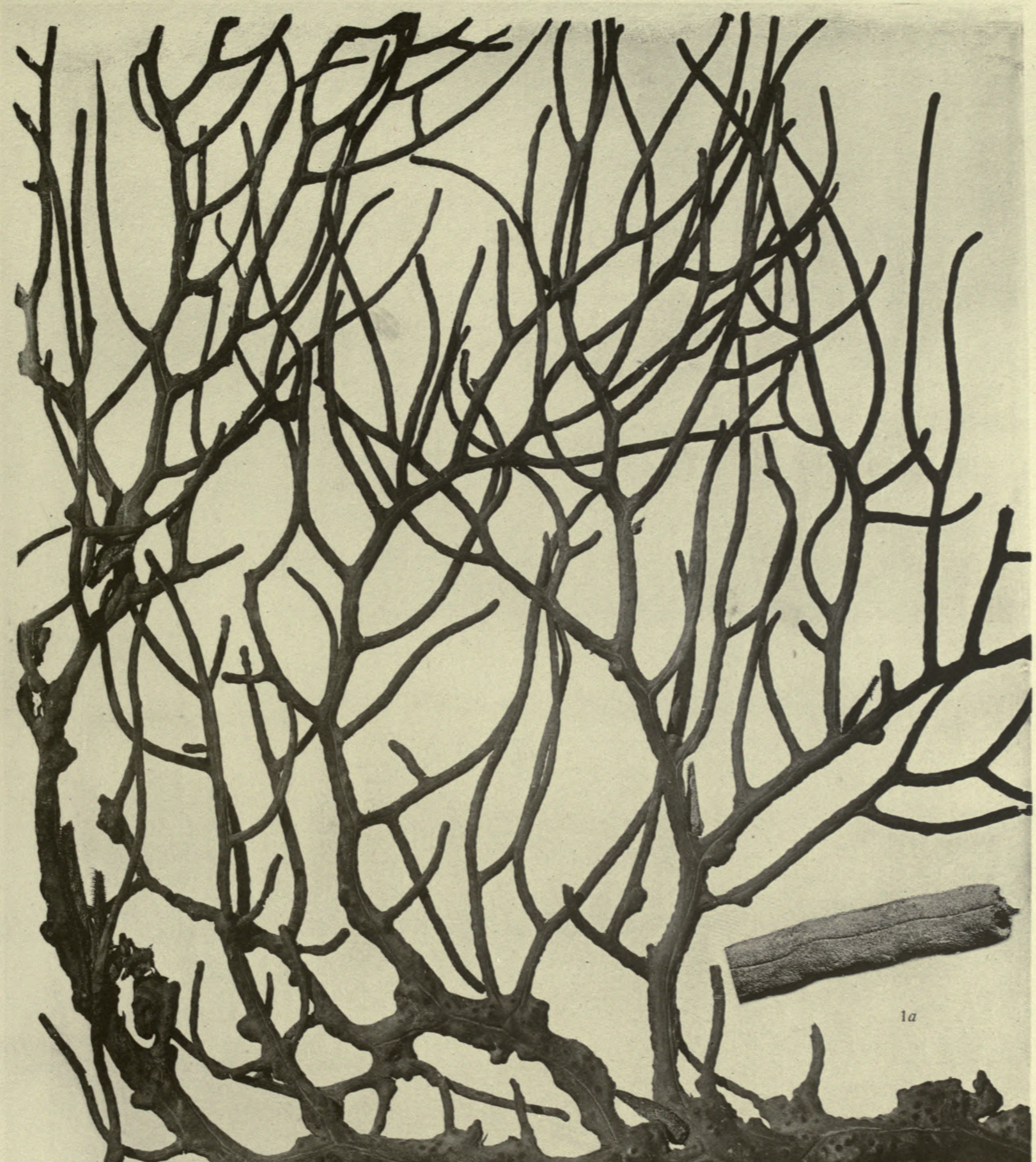

PLATE VI.

Fig. 1. *Suberogorgia pulchra* n. sp. Natural size.	1*a*, part of branch × 5.
Fig. 2. *Suberogorgia thomsoni* n. sp. Natural size.	2*a*, tip of twig × 5.
Fig. 3. *Koroeides koreni* Wright and Studer. Natural size.	3*a*, tip of branch × 5.

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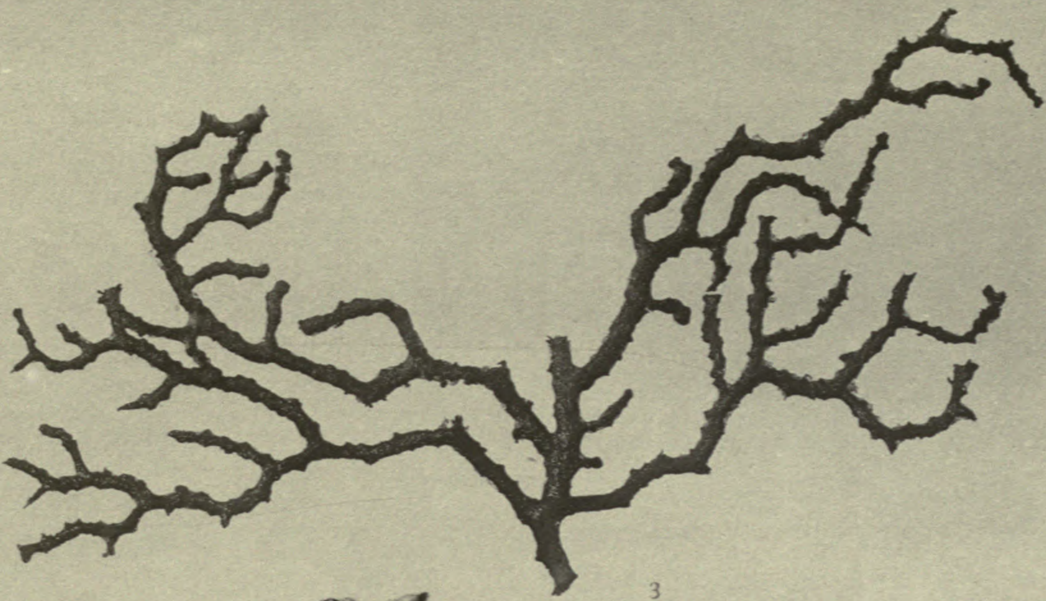
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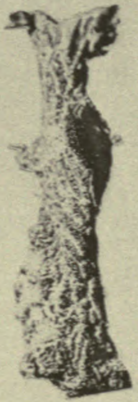
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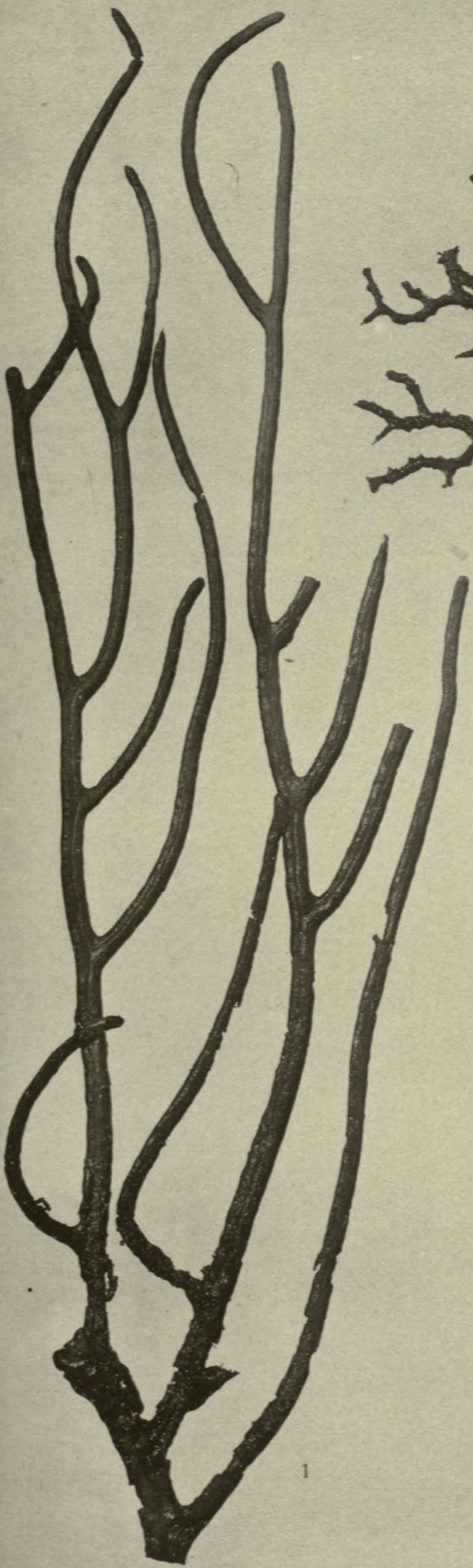
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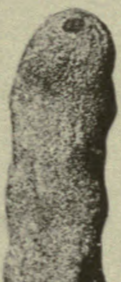
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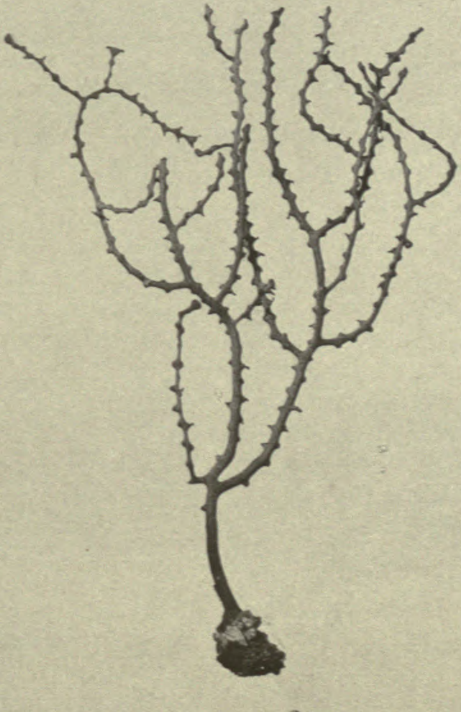
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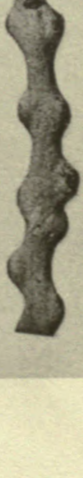
2a

PLATE VII.

Fig. 1. *Melitodes squamata* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Melitodes modesta* n. sp. Natural size. 2*a*, part of twig × 5.
Fig. 3. *Acabaria formosa* n. sp. Natural size. 3*a*, part of branch × 5.

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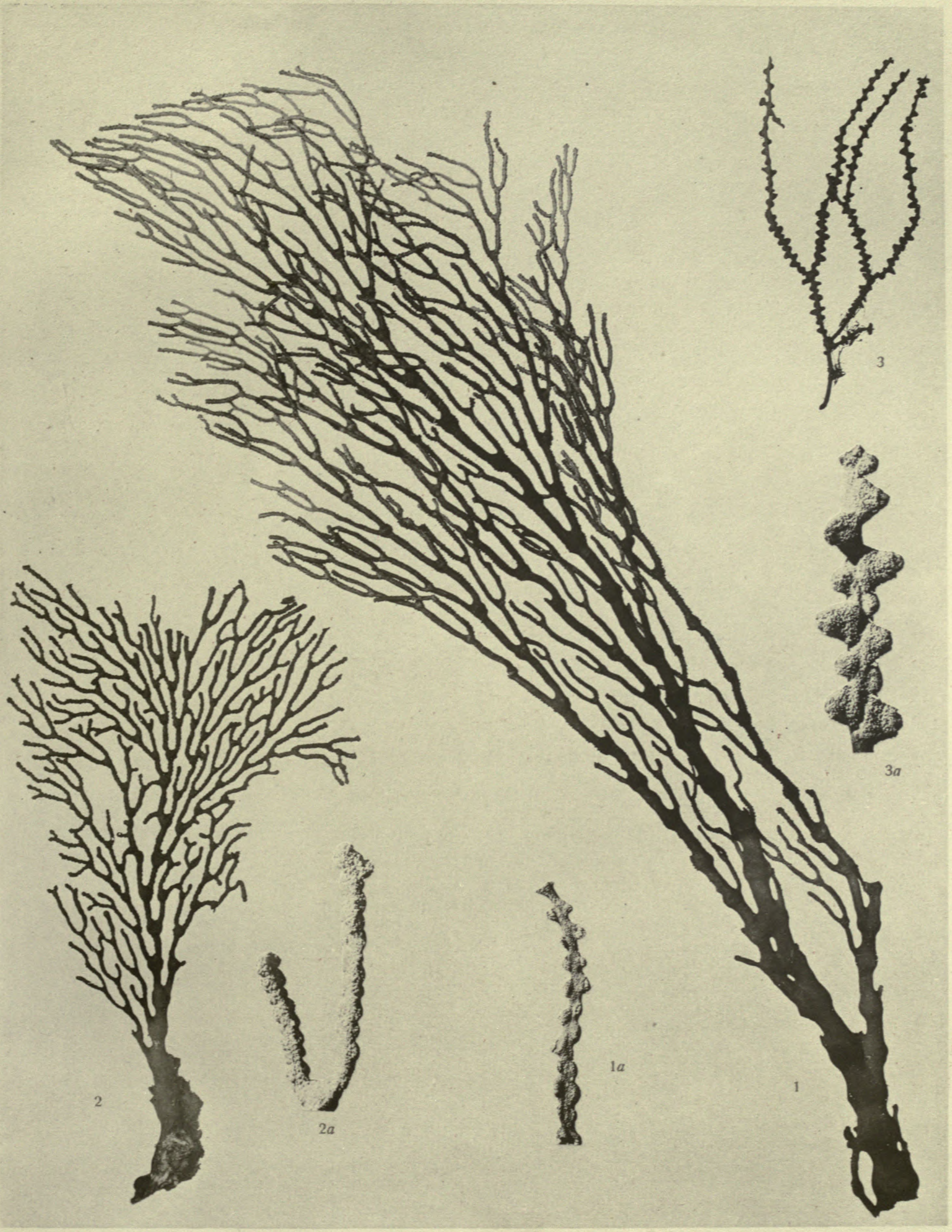
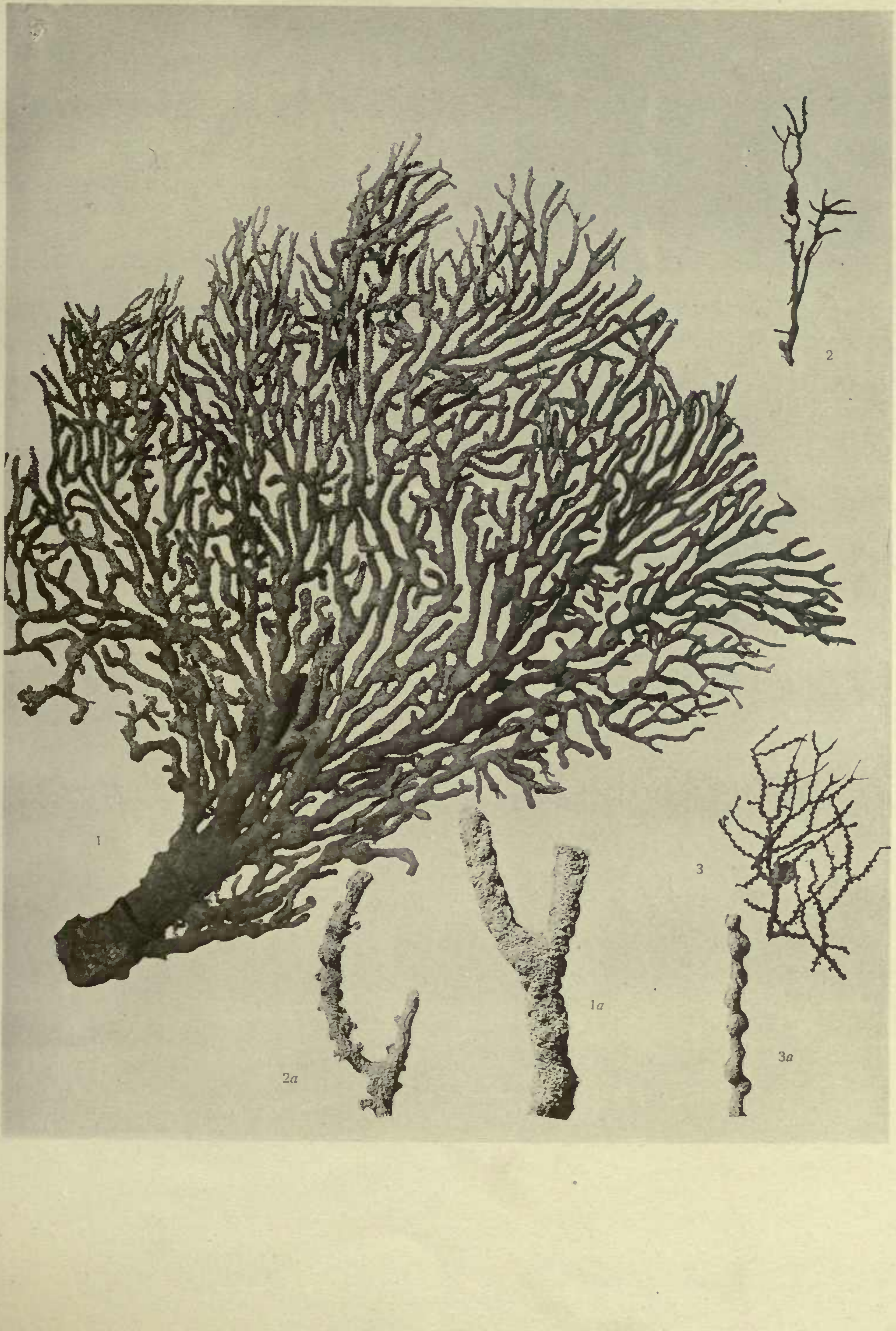


PLATE VIII.

Fig. 1. *Mopsella spongiosa* n. sp. Natural size.	1*a*, tip of branch × 5.
Fig. 2. *Acabaria triangulata* n. sp. Natural size.	2*a*, tip of branch × 5.
Fig. 3. *Acabaria hicksoni* n. sp. Natural size.	3*a*, tip of branch × 5.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1
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1a
2a
3a

PLATE IX.

Fig. 1. *Mopsella studeri* n. sp. Natural size. 1*a*, part of branch × 5.

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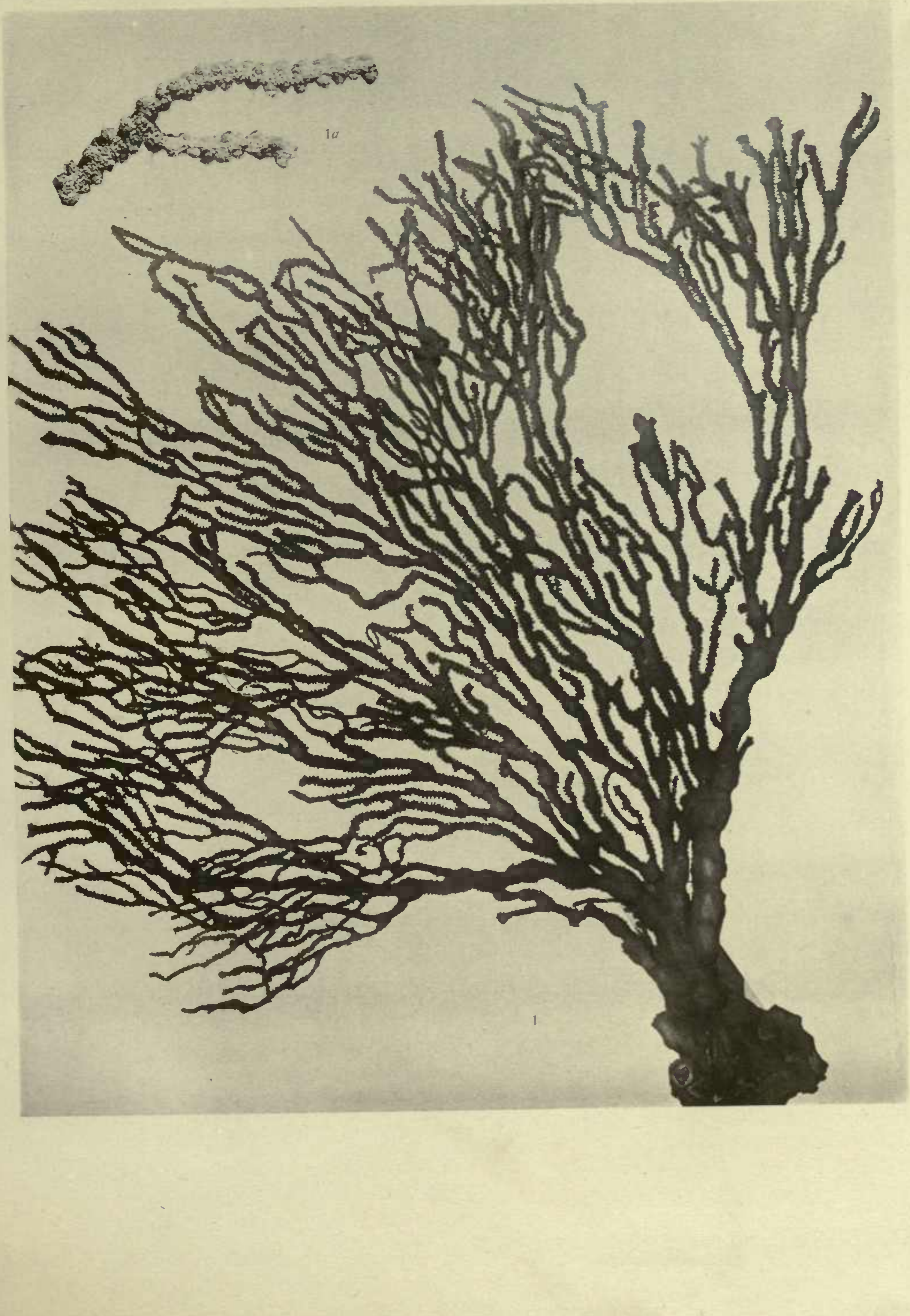

PLATE X.

Fig. 1. *Birotulata splendens* n. sp. Natural size. 1*a*, part of branch × 5.
Fig. 2. *Birotulata splendens* n. sp. Another branch, natural size.

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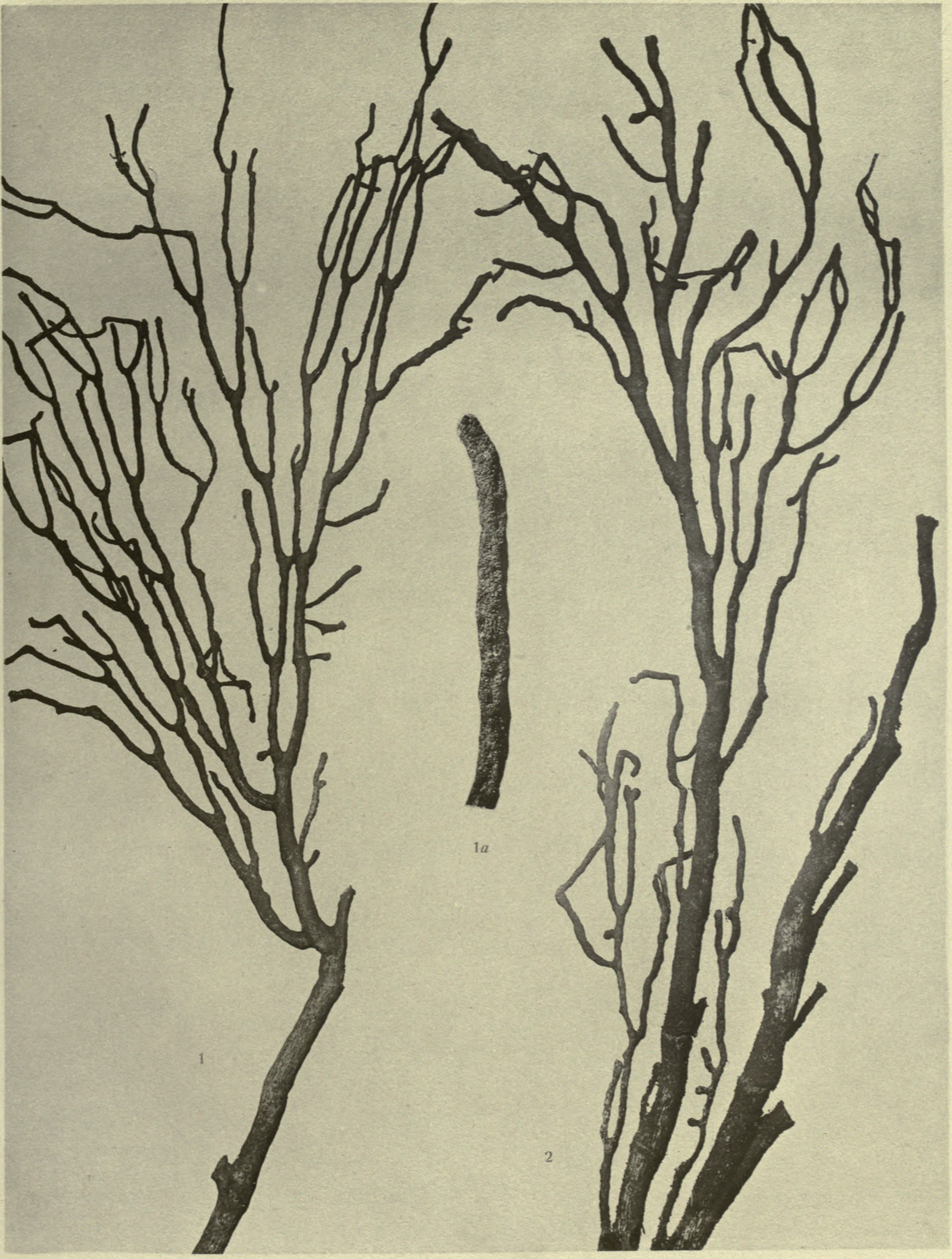

PLATE XI.

Fig. 1. *Solenocaulon querciformis* n. sp. *a, b* and *c,* spicules from the cœnenchyma; *d* and *e,* spicules from the axis. *a* × 100; the others × 88.

Fig. 2. *Solenocaulon jedanensis* n. sp. *a,* spicule from the axis; *b* and *c,* forms from the inner walls of calyces; *d,* from the cœnenchyma. All × 120.

Fig. 3. *Semperina brunnea* n. sp. *a* and *b,* spicules from the axis; the others from the cœnenchyma. All × 120.

Fig. 4. *Suberia excavata* n. sp. *a,* spicule from the axis; *b,* a Y-shaped form from the cœnenchyma. Both × 120.

Fig. 5. *Suberia macrocalyx* n. sp. *a, b* and *c,* spicules from the cœnenchyma; × 88.

Fig. 6. *Titanidium friabilis* n. sp. *a* and *c,* spicules from the cœnenchyma; *d,* an intermediate form; *b,* a spicule from the axis. All × 120.

Fig. 7. *Suberogorgia appressa* n. sp. *a* and *b,* spicules from the cœnenchyma, *c,* an axis spicule. All × 250.

Fig. 8. *Suberogorgia thomsoni* n. sp. *e,* an axis spicule; *a, b, c* and *d,* forms found in the cœnenchyma.

Fig. 9. *Suberogorgia pulchra* n. sp. *a* and *g,* fragments of the spicular mesh of the axis; *b, c, e* and *f,* oval forms from the cœnenchyma; *d,* rod-shaped form.

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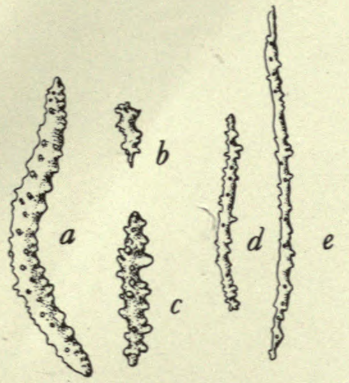

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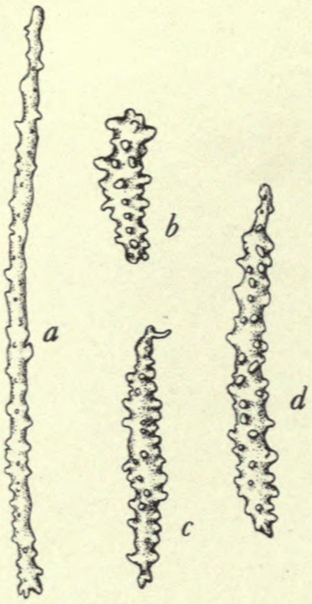

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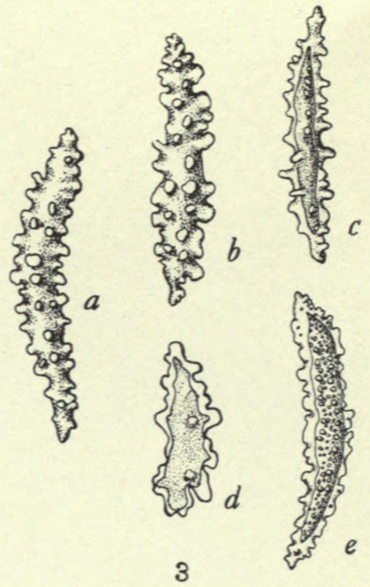

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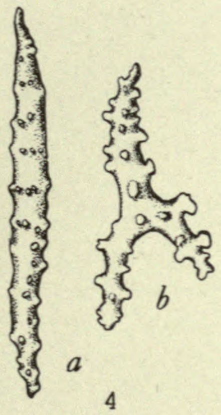

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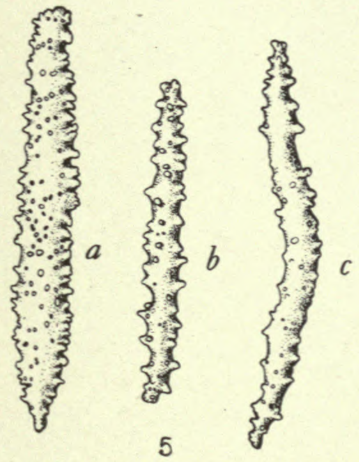

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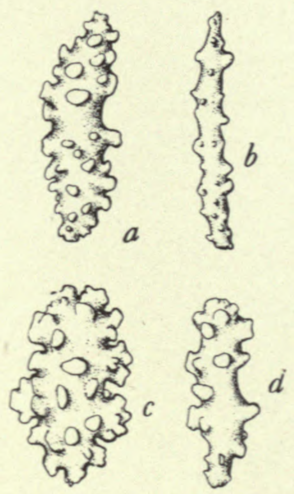

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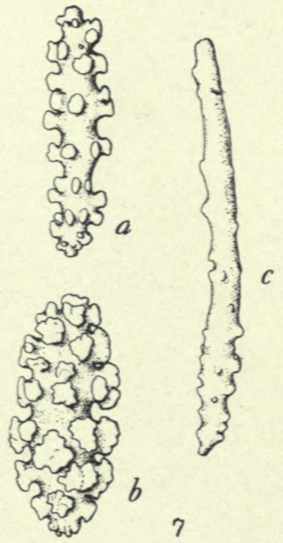

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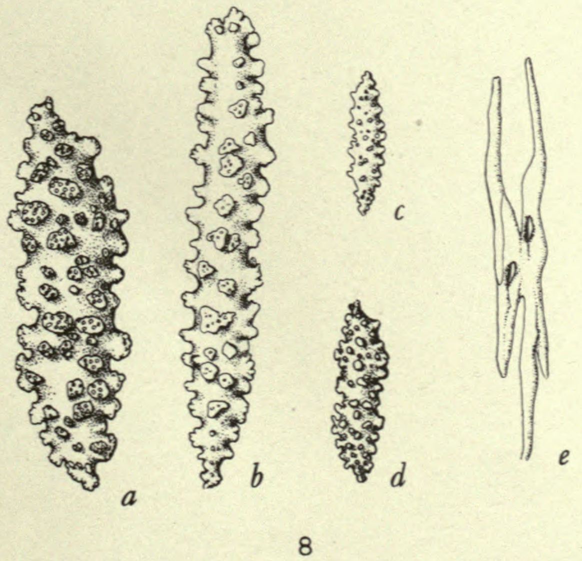

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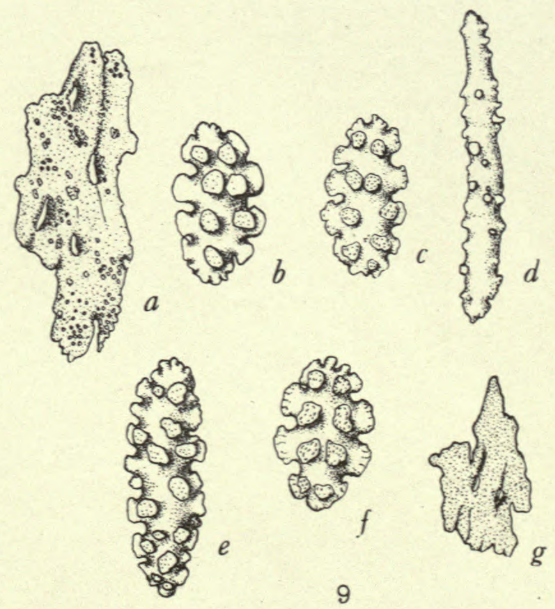

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PLATE XII.

Fig. 1. *Melitodes squamata* n. sp. *a,* bent tuberculate spindle from polyp; *b, c, d* and *e,* spicules from the cœnenchyma. All × 250.

Fig. 2. *Melitodes modesta* n. sp. *a* and *b,* spindles from the cœnenchyma; *c,* one-sided spicule from cœnenchyma. All × 250.

Fig. 3. *Acabaria formosa* n. sp. *a, b, c* and *f,* bent spindles; *d,* spiny club; *e,* short, stout form. All × 250.

Fig. 4. *Acabaria hicksoni* n. sp. *a, b* and *c,* heavy bent spindles; *d* and *e,* irregular forms. *a* and *e* × 120; the rest × 250.

Fig. 5. *Acabaria triangulata* n. sp. *a,* triangular form; *b,* irregular spindle; *c,* club-shaped form. All × 120.

Fig. 6. *Mopsella studeri* n. sp. *a, b* and *c,* characteristic Blattkeulen with foliaceous projections; *d,* bent, irregular spindle. All × 250.

Fig. 7. *Mopsella spongiosa* n. sp. *a,* bent spindle; *b* and *f,* foliaceous clubs; *c,* irregular spindle; *d,* characteristic Blattkeule. All × 250.

Fig. 8. *Birotulata splendens* n. sp. *a,* bent spindle from polyp; *b,* a combination form; *d* and *e,* short spindles; *c, f, g,* characteristic double wheels. All × 250.

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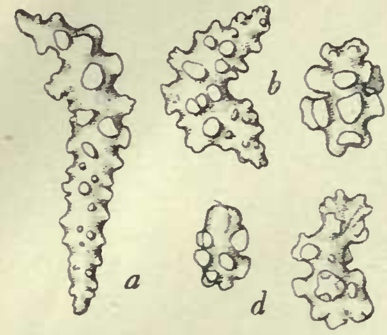

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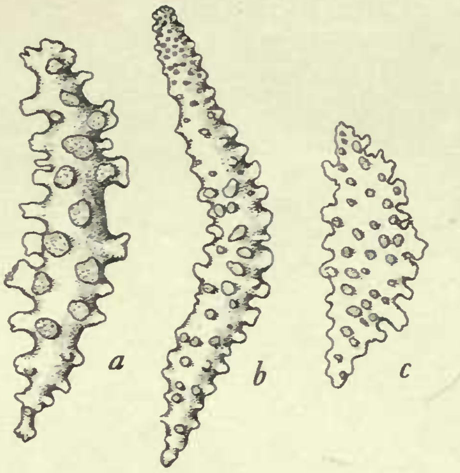

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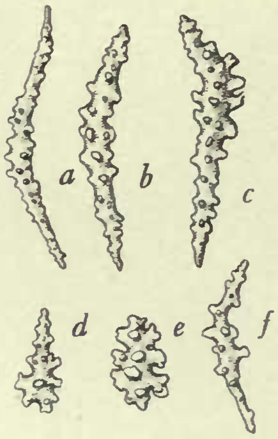

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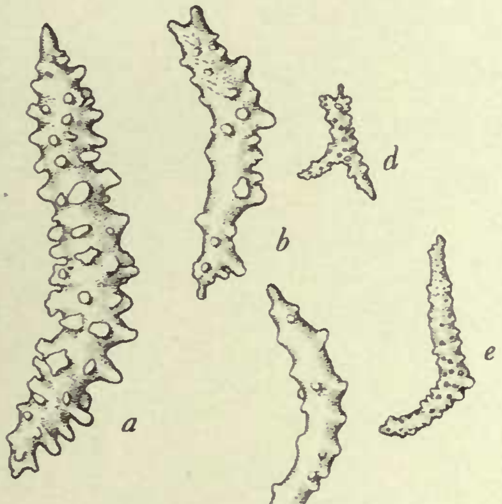

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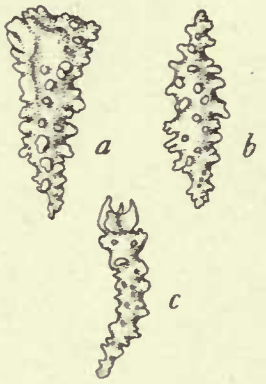

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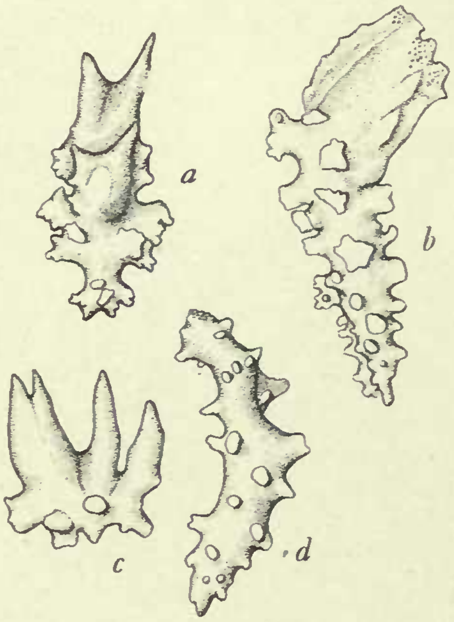

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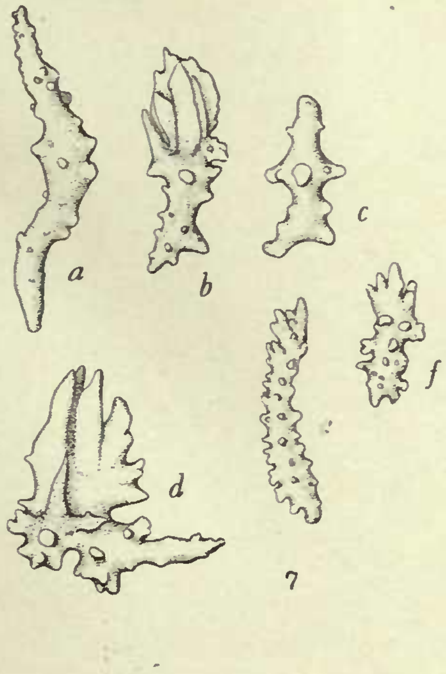

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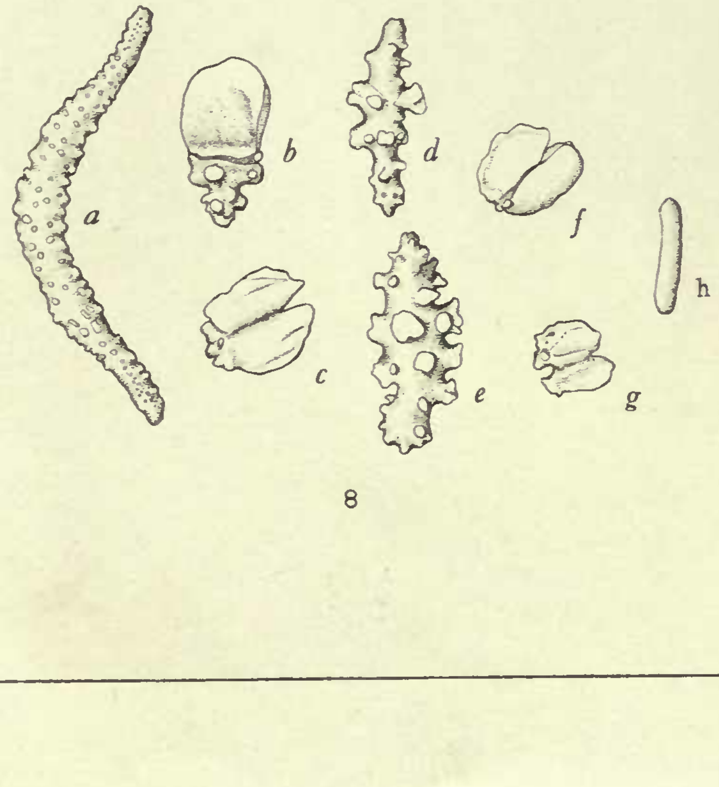

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